

Final Draft
REMEDIAL ACTION PLAN

**Niles Square
37482, 37592, and 37682
Niles Boulevard
Fremont, California**

11 August 2006

Prepared for:

City of Fremont Redevelopment Agency

EKI A10071.00

**FINAL DRAFT
REMEDIAL ACTION PLAN**

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ACRONYMS AND ABBREVIATIONS

ACWD	Alameda County Water District
ARARs	Applicable or Relevant and Appropriate Requirements
bcy	bank (in-place) cubic yard
BEC	Baseline Environmental Consulting
bgs	below ground surface
Cal-EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHHSLs	California Human Health Screening Levels
CHSC	California Health and Safety Code
City Lot 1	37482 Niles Boulevard
City Lot 2	37682 Niles Boulevard
cm/s	centimeters per second
COPCs	chemicals of potential concern
DAF	dilution attenuation factor
DTSC	Department of Toxic Substances Control
EKI	Erler & Kalinowski, Inc.
ESLs	environmental screening levels
Former UPRR Property	37592 Niles Boulevard
Fremont	City of Fremont Redevelopment Agency
LeadSpread	DTSC Lead Risk Assessment Spreadsheet
MCLs	maximum contaminant levels
µg/L	micrograms per liter
µg/m ³	micrograms per cubic meter
mg/kg	milligrams per kilogram
NBAR	Non-Binding Allocation of Responsibility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
Niles Cone	Niles Cone Groundwater Basin
O&M	Operation and Maintenance
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PRGs	U.S. EPA Region IX preliminary remediation goals
PRPs	potentially responsible parties
QA/QC	Quality Assurance/Quality Control
RAOs	Remedial Action Objectives

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ACRONYMS AND ABBREVIATIONS

RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RWQCB	California Regional Water Quality Control Board, San Francisco Bay Region
Site	Niles Square, including 37482, 37592, and 37682 Niles Boulevard in Fremont, California
STLC	soluble threshold limit concentration
SVOCs	semi-volatile organic compounds
TBC	non-promulgated, non-binding requirement designated "To Be Considered" in selection of a remedial alternative
TCG	The Consulting Group
TPH	total petroleum hydrocarbons
TPH-d	total petroleum hydrocarbons as diesel
TPH-g	total petroleum hydrocarbons as gasoline
TPH-mo	total petroleum hydrocarbons as motor oil
UCL	upper confidence limit of the arithmetic mean
UPRR	Union Pacific Railroad
U.S. EPA	U.S. Environmental Protection Agency
USTs	underground storage tanks
VOCs	volatile organic compounds
WET	Waste Extraction Test

EXECUTIVE SUMMARY

Erler & Kalinowski, Inc. (“EKI”) has prepared this Draft Remedial Action Plan (“RAP”) for the 37592 Niles Boulevard property and adjacent properties located at 37482 and 37682 Niles Boulevard in Fremont, California (collectively known as Niles Square and herein referred to as the “Site”; see Figures 1 and 2) on behalf of the City of Fremont Redevelopment Agency (“Fremont”). This RAP is prepared in general accordance with California Health and Safety Code (“CHSC”) Section 25356.1 and with the RAP Policy No. EO-95-007-PP, published by the California Environmental Protection Agency (“Cal-EPA”), Department of Toxic Substances Control (“DTSC”) on 16 November 1995 (DTSC, 1995).

This RAP summarizes the Site background and previous remedial investigations conducted at the Site; presents a human health risk evaluation; defines Remedial Action Objectives (“RAOs”); summarizes a screening-level assessment of potential remedial technologies; evaluates remedial alternatives consistent with criteria contained in the United States Environmental Protection Agency (“U.S. EPA”) National Oil and Hazardous Substances Pollution Contingency Plan (“NCP”, U.S. EPA, 1993), as set forth in 40 Code of Federal Regulations (“CFR”) Part 300, and the additional evaluation criteria contained in the CHSC; presents a recommended remedial alternative; and discusses the elements of a public participation program.

Fremont currently intends to develop the Site with a mix of commercial, retail, recreational (park space) land uses including a town square area and urban residential units (e.g., apartments and condominiums). The residential units will be located on the second floor and above in multi-story buildings. Remedial action alternatives are developed herein to be consistent with those future land uses. In addition, the Site will be developed in phases. The first phase will be the development of the town square area, with other development to follow. This staged development is compatible with the remedial alternatives evaluated in this RAP.

Site Background and Previous Remedial Investigations

The Site was utilized for railroad operations from the late 1800s until the late 1980s. At the peak of operations the Site facilities included a passenger terminal, a freight station, and maintenance facilities for a steam locomotive. Several spur tracks crossed the Site from east to west (Figure 2). Freight operations at the Site included handling of supplies for agricultural and ceramics industries that operated in Fremont. A wide variety of chemicals were transported through the Site and utilized in the railroad operations.

Three phases of remedial investigations have been conducted on the Site. The first phase occurred in the early 1990s associated with the removal of underground storage tanks (“USTs”) by Union Pacific Railroad (“UPRR”). These investigations included collection of soil samples from beneath former tank locations and the installation of a groundwater monitoring well (MW-1) through the bottom of one tank excavation where there were indications of a release of petroleum fuel to soil. Groundwater monitoring was conducted at well MW-1 (Figures 3 and 4) for several years. Closure of the tank-related investigations was granted by the Alameda County Water District (“ACWD”) and the California Regional Water Quality Control Board, San Francisco Bay Region (“RWQCB”) in the mid 1990s.

The second phase of investigations began in 2000 and continued through 2003 as part of acquisition of the Site by Fremont. These investigations were conducted to evaluate the presence of chemicals of concern in soil and groundwater related to the former UPRR operations on the Site.

The third phase of investigations was conducted in 2004 to provide additional stratigraphic and hydraulic conductivity data to support development of remedial alternatives.

The primary findings of these three phases of remedial investigations are as follows:

Up to four feet of fill soil of various types have historically been placed across the surface of the Site.

Groundwater is generally encountered in Site monitoring wells and boreholes at depths of approximately 36 to 40 feet below ground surface (“bgs”). The groundwater gradient direction is to the south in the direction of Alameda Creek.

Chemicals of potential concern (“COPCs”) are detected within the upper 3 to 5 feet of soil and are primarily confined to the fill soil layer. The primary COPCs at the Site are arsenic, lead, and total petroleum hydrocarbons (“TPH”). Other metals considered COPCs are generally collocated with elevated arsenic concentrations and are infrequently detected.

Groundwater sampling results for permanent monitoring wells confirm that the COPCs in Site soil are not impacting groundwater underneath the Site.

Human Health Risk Evaluation

An evaluation of the potential risks to human health due to the chemicals detected in soil at the Site was performed by comparing Site data to U.S. EPA Region IX Preliminary Remediation Goals (“PRGs”) for residential land use (U.S. EPA, 2004b), the California

Human Health Screening Levels (“CHHSLs”; Cal-EPA, 2005), and, for TPH, the San Francisco Bay Region Environmental Screening Levels (“ESLs”). The PRG guidance document (U.S. EPA, 2004a) indicates that generally, at sites where contaminant concentrations fall below PRGs, no further action is warranted under the Superfund program, so long as the exposure assumptions at a site match those used in developing the PRGs. The residential PRGs, CHHSLs, and ESLs were developed using exposure parameters that are similar to and likely more stringent than would be expected for future land use at the Site, and therefore are considered conservative screening criteria for chemicals in soil at the Site.

Arsenic is present in surface soil across the Site at concentrations up to 313 milligrams per kilogram (“mg/kg”), which exceeds the most conservative PRG for residential land use (0.39 mg/kg) and the CHHSL for residential land use (0.7 mg/kg). The concentrations of naturally-occurring arsenic in soil in the San Francisco Bay Area are typically above these residential land use screening levels. Therefore, arsenic concentrations are compared to naturally-occurring background levels instead of PRGs and CHHSLs to determine whether cleanup may be required.

Lead was detected in single grab soil samples (i.e., “discrete” soil samples) at the Site at concentrations up to 390 mg/kg, which is above the CHHSL for residential land use (150 mg/kg) but below the PRG for residential land use (400 mg/kg)¹. The DTSC Lead Risk Assessment Spreadsheet (“LeadSpread”) was used to determine whether cleanup may be required for Site soil containing lead. With a few limited and isolated exceptions², no other chemicals have been detected in soil samples at concentrations exceeding PRGs or CHHSLs for residential land use.

Total petroleum hydrocarbons as diesel (“TPH-d”) and motor oil (“TPH-mo”) have been detected in Site soil samples at maximum concentrations of 630 mg/kg and 1,900 mg/kg, respectively, which exceed residential ESLs for the protection of groundwater quality, as issued by the RWQCB, 2005. Residential ESLs for TPH-d and TPH-mo are 100 mg/kg and 500 mg/kg, respectively. TPH, arsenic, and lead have not been found to be impacting groundwater quality at the Site under existing conditions.

¹ During a limited Phase II investigation conducted by others during 2000, lead was detected in a composite soil sample at a maximum concentration of 540 mg/kg. Subsequent data are considered more representative of the Site conditions; see text Sections 2.2.2.1 and 2.3.

² One sample contained antimony at the PRG and above the CHHSL for residential land use, three samples contained cadmium slightly above the CHHSL but below the PRG for residential land use, and three samples contained thallium above the PRG but below the CHHSL for residential land use. Refer to the text for details.

Remedial Action Objectives

The first step in the evaluation of remedial alternatives for the Site is development of remedial action objectives (“RAOs”). The RAOs for contaminated Site soil are intended to guide remedial actions that mitigate the identified potential threats to human health and the environment in a manner consistent with current and potential future uses of the Site.

At the Site, the only identified potential risks to human health or the environment are (a) the presence of arsenic in shallow soil above its PRG and CHHSL and above naturally occurring background concentrations, i.e., potentially allowing exposure to the arsenic through fugitive dust emissions or direct contact (see Section 3.1), (b) the presence of lead in shallow soil above protective levels estimated using LeadSpread, i.e., potentially allowing exposure to lead through fugitive dust emissions or direct contact (see Section 3.1) and (c) the presence of TPH above ESLs in shallow soil, which may present a potential for impact to groundwater, although groundwater quality has not been impacted at the Site to date.

RAOs have been developed for the Site that are protective of human health and the environment, considering the future Site use, and consistent with the identified Applicable or Relevant and Appropriate Requirements (“ARARs”) and the To Be Considered (“TBCs”) requirements. The RAOs for the Site are as follows:

Reduce or eliminate the potential for future exposure to soil containing arsenic at concentrations above naturally occurring background levels;

Reduce or eliminate the potential for future exposure to soil containing lead at concentrations above the Site-specific remediation goal calculated using DTSC’s LeadSpread;

Perform the remedial action in a manner that is protective of air quality during remediation and groundwater quality following completion of the remedy; and

Facilitate future development of the property.

Soil Remedial Goals

Based on proposed future Site uses and the concentrations of arsenic and lead currently present in surface soil at the Site, remedial actions will be performed at the Site. Current Site development plans do not include single-family or first floor multi-tenant residences.

Given these development plans, an evaluation of Site data and RAOs, and a human health risk evaluation, the following soil remedial goals have been selected for the Site: 14 mg/kg average concentration³ with a maximum concentration in a single sample of 26 mg/kg for arsenic; 255 mg/kg for lead; 100 mg/kg for TPH-d; and 500 mg/kg for TPH-mo.

Feasibility Study

Remedial alternatives that could potentially be implemented to satisfy the RAOs are identified and evaluated in detail in Section 4 of the text. These remedial alternatives include:

Remedial Alternative A: No Action

Remedial Alternative B: Maintenance of Cover and Fence, Groundwater Monitoring, and Institutional Controls

Remedial Alternative C (including two phases): Phase I - Soil Excavation With Off-Site Disposal, and Phase II - Focused Soil Excavation with Off-Site Disposal, Maintenance of Site Cover, and Institutional Controls

Remedial Alternative D: Comprehensive Soil Excavation and Off-Site Disposal

Remedial Alternative E: Comprehensive Soil Excavation and On-Site Consolidation with Maintenance of Site Cover and Institutional Controls

The five remedial alternatives were subjected to detailed analysis and comparison based on the nine NCP evaluation criteria for feasibility studies, as well as the six evaluation criteria set forth in the CHSC Section 25356.1 Subsection (d). The NCP and CHSC criteria are as follows:

NCP Evaluation Criteria

1. Overall protection of human health and the environment;
 2. Compliance with ARARs;
 3. Long term effectiveness and permanence;
 4. Reduction of toxicity, mobility, or volume through treatment;
 5. Short term effectiveness;
 6. Implementability;
 7. Costs;
-

³ Calculated using the 95% upper confidence limit ("UCL") of the arithmetic mean.

8. State acceptance; and
9. Community acceptance.

CHSC Evaluation Criteria

1. Health and safety risks posed by the conditions at the Site;
2. Effects of the contamination or pollution levels upon future, and probable beneficial uses of impacted, polluted, or threatened resources;
3. Effects of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses;
4. Site-specific characteristics;
5. Cost-effectiveness of alternative remedial measures; and
6. Potential environmental impacts of alternative remedial action measures.

Based on the detailed analysis of the remedial alternatives, Alternative C is proposed as the best remedial alternative for the Site. By comparison, Alternatives A and B were judged to not adequately attain the RAOs described above. While Alternatives C, D and E were found to attain the RAOs and satisfy the NCP and CHSC criteria, Alternative E is not expected to gain the approval of the local groundwater agency (ACWD). Alternative C is judged to be more cost-effective than Alternative D and is therefore the recommended remedial action. Alternative C was evaluated assuming two phases of development. The first phase would include excavation of soil to meet the remedial goals in the town square area, with off-Site disposal of excavated soil. The second phase would include excavation of soil outside the town square area to meet remedial goals in areas below building footprints, utility corridors, and planting areas (estimated to be approximately 40% of the total area with soil containing arsenic, lead and/or TPH above remedial goals). Soil excavated during Phase II is proposed to be disposed off-Site to permitted facilities. Unexcavated Phase II soil containing arsenic, lead and/or TPH above remedial goals will be covered with redevelopment materials such as hardscape and/or limited softscape and subject to ongoing inspection, monitoring, and land use restriction. Alternatively, Fremont may choose to excavate and dispose of all soil containing COPCs above remedial goals, thereby eliminating the need for inspection, monitoring, maintenance, reviews, and land use restrictions. The Phase II component of the proposed Alternative C is conceptual and will be described in additional detail during the Remedial Design phase (described below).

Remedial Action Implementation

The key components of the proposed remedial action are as follows:

During Phase I, soil containing arsenic, lead, and TPH at concentrations above the remedial goals will be excavated from the town square area and disposed off-Site to permitted facilities;

The Phase I areas identified as requiring remediation to meet the RAOs will be excavated, sampled to confirm removal of soil containing COPCs above remedial goals, backfilled with clean soil, and will become available for unrestricted development and use for building construction, installation of utilities, or deep root landscaping;

During Phase II, soil containing arsenic, lead, or TPH at concentrations above the remedial goals will be excavated from below proposed building footprints, utility corridors, and planting areas and disposed off-Site to permitted facilities. As described below, the City may elect to remove all soils containing COPCs at concentrations above remedial goals from the Site;

The Phase II areas identified as requiring remediation to meet the RAOs will be excavated, sampled to confirm removal of soil containing COPCs above remedial goals, backfilled with clean soil, and will become available for unrestricted development and use for building construction, installation of utilities, or deep root landscaping;

The unexcavated portion of the Phase II area (i.e., parking and other non-structural use areas) where soil contains COPCs above remedial goals will be covered with redevelopment materials such as hardscape and/or limited areas of softscape to limit potential exposure to future populations. Detailed plans for any such covering in the Phase II area will be submitted to the DTSC for review and approval;

If soils are left on the Site at concentrations above the remedial goals, inspection and monitoring of the hardscape and limited areas of softscape covering Site soil containing COPCs above remedial goals will be performed periodically following the remediation activities to document that the covers are effectively preventing human exposure to soil containing COPCs at concentrations above remedial goals. A review of the remedy would be conducted every five years as long as contaminated soil remains on-Site consistent with the U.S. EPA Comprehensive Five-Year Review document dated June 2001 and produced by the Office of Emergency and Remedial Response authorized by CERCLA (U.S. EPA, 2001);

Dust control and ambient air monitoring will be performed during the excavation and handling of contaminated soil at the Site during both Phase I and Phase II to protect ambient air quality at and adjacent to the Site during implementation of the remedial action;

Deed restrictions will be placed on any unexcavated portion of the Phase II area where soil contains COPCs above remedial goals in the form of a land use covenant which, at a minimum, will include the following requirements:

- a) The locations where Site soil contains COPCs above remedial goals will be limited to commercial or industrial land use or parking;

- b) Activities that will disturb the contaminated soil will not be permitted without a Soil Management Plan and Health and Safety Plan approved by DTSC; and
- c) Contaminated soil brought to the surface by grading, excavation, trenching, or backfilling will be managed in accordance with applicable provisions of state and federal law.

As described above, Fremont may choose to excavate and dispose of all Site soil in the Phase II Area containing COPCs above remedial goals. In this instance, no long-term monitoring, maintenance, inspection, review, or deed restrictions would be required after the completion of Phase II remediation activities. Phase II of Alternative C as described herein is conceptual. A detailed Remedial Design plan for Phase II will be submitted to DTSC for review at a later time as part of a specific proposed redevelopment, as described below.

Remedial Design

Following public review of the proposed remedial action and DTSC approval, Fremont will submit a Remedial Design plan describing the proposed remedial action and providing detailed procedures to be followed during excavation and off-Site disposal. Separate Remedial Design plans will be prepared for the Phase I and Phase II areas. The Remedial Design plan for Phase I is being prepared concurrently with the completion of this RAP, and the Remedial Design for the Phase II area will be prepared at a later date. The Remedial Designs for Phase I and Phase II will include: (a) an excavation plan; (b) cover design (if applicable); (c) a sampling and analysis plan for cleanup confirmation; (d) a transportation plan; (e) a health and safety plan; and (f) a quality assurance/quality control plan. As part of the development of the Phase II Remedial Design, a detailed cost analysis will be conducted to support the cost effectiveness of leaving soils containing COPCs on-Site. If soil containing COPCs above remedial goals will remain on-Site as part of Phase II, the Remedial Design for Phase II will additionally include an O&M and Soil Management Plan to describe how maintenance and monitoring activities will be implemented and will describe long-term ownership plans for the Phase II property.

Schedule

The tentative schedule for remedial work is as follows:

Draft RAP Comment Period:	1 Month
Final RAP/Responsiveness Summary:	2 Weeks
Remedial Design Plan Review by DTSC:	1 Month

Phase I RAP Implementation/Town Square Construction: 12 Months

Phase I Remedial Action Completion Report: 2 to 3 Months

Phase I remedial action and redevelopment of the town square area are planned to begin in 2006 and require approximately one year to complete. Phase II of the remedial action includes focused remediation of areas outside the town square area and construction of commercial/residential properties and parking facilities. Phase II is anticipated to begin in 2007 and require up to 10 years to complete.

1 INTRODUCTION

Erler & Kalinowski, Inc. (“EKI”) has prepared this Draft Remedial Action Plan (“RAP”) for the 37592 Niles Boulevard property and adjacent properties located at 37482 and 37682 Niles Boulevard in Fremont, California (collectively known as Niles Square and herein referred to as the “Site”; see Figures 1 and 2) on behalf of the City of Fremont Redevelopment Agency (“Fremont”). This RAP is prepared in general accordance with California Health and Safety Code (“CHSC”) Section 25356.1 and with the RAP Policy No. EO-95-007-PP, published by the California Environmental Protection Agency (“Cal-EPA”), Department of Toxic Substances Control (“DTSC”) on 16 November 1995 (DTSC, 1995). The Non-Binding Allocation of Responsibility (“NBAR”) prepared by the DTSC pursuant to CHSC Section 25356.1 (e) is included as Appendix A.

This RAP summarizes the Site background and previous remedial investigations conducted at the Site; presents a human health risk evaluation; defines Remedial Action Objectives (“RAOs”); summarizes a screening-level assessment of potential remedial technologies; evaluates remedial alternatives consistent with criteria contained in the United States Environmental Protection Agency (“U.S. EPA”) National Oil and Hazardous Substances Pollution Contingency Plan (“NCP”, U.S. EPA, 1993), as set forth in 40 Code of Federal Regulations (“CFR”) Part 300, and the additional evaluation criteria contained in the CHSC; presents a recommended remedial alternative; and discusses the elements of a public participation program. Reports, data, policy, and other documents that were relied upon or considered in selecting the remedial alternative for the Site are described in the Administration Record List in Appendix B.

This RAP is comprised of the following seven sections:

- Section 1 – Introduction
- Section 2 – Remedial Investigation Summary
- Section 3 – Remedial Action Objectives
- Section 4 – Feasibility Study
- Section 5 – Remedial Action Plan
- Section 6 – References

1.1 Site Vicinity

The Site is located east of the San Francisco Bay in Fremont, California, at the intersection of Niles Boulevard and I Street, north of Alameda Creek (Figure 1). The Site is bounded by railroad tracks and Highway 238 to the north and east and a post office,

library, and fire station to the south. Retail businesses and homes are located across Niles Boulevard to the west; this area includes a public park and a community center along Alameda Creek approximately 1,000 to 1,500 feet to the west of the Site, and a Veteran's memorial building and railroad museum to the northwest of the Site.

1.2 Site Background

The Site was utilized for railroad operations from the late 1800s until the late 1980s. At the peak of operations the Site facilities included a passenger terminal, a freight station, and maintenance facilities for a steam locomotive. Several spur tracks crossed the Site from east to west (Figure 2). Freight operations at the Site included handling of supplies for agricultural and ceramics industries that operated in Fremont. A variety of chemicals were transported through the Site and utilized in the railroad operations. The history of the Site is described below.

37592 Niles Boulevard ("the Former UPRR Property"): The Former UPRR Property was used as a railyard and owned by the Union Pacific Railroad ("UPRR") for many years. In the *Phase I - Environmental Site Assessment & "Limited" Phase II Environmental Site Assessment Report for Union Pacific Parcel, 37592 Niles Blvd, Fremont, California*, prepared by The Consulting Group ("TCG") and dated May 2000 (TCG, 2000), TCG indicates the Site was developed prior to 1954 (Figure 2) and is covered by typical railyard gravels with numerous pieces of railroad equipment. TCG reported a small building and a shed present on the property. The Former UPRR Property is partially fenced and generally unpaved, and there is an older, wooden railroad building on the western portion of the property (EKI, 2003a).

37482 Niles Boulevard ("City Lot 1"): Based on a review of aerial photographs, buildings were not present on this property until the 1980s (EKI, 2002). A public restroom is located in the southwestern portion of City Lot 1.

37682 Niles Boulevard ("City Lot 2"): A jail and firehouse were present on this property and demolished in 1978, and a "refrigeration service business" was located on this property until the 1980s (EKI, 2002).

Fremont has owned City Lots 1 and 2 since the 1980s and acquired the Former UPRR Property from UPRR in 2005.

1.3 Local Climate

The climate of Site location is Mediterranean, with mild wet winters and warm dry summers. The average rainfall is approximately 14 inches per year. Mean high and low temperatures vary from 59 and 41 degrees Fahrenheit in January to 85 and 79 degrees in June.

2 REMEDIAL INVESTIGATION SUMMARY

This Section presents the results of environmental investigations conducted at the Site by EKI on behalf of Fremont and by others, and includes the following:

a summary of available information regarding the Site, including physical characteristics;

identification of potential sources of contamination based on available information regarding past Site uses; and

a summary of soil and groundwater investigations conducted to date, and a description of the known nature and extent of contamination.

2.1 Regional Geologic and Hydrogeologic Setting

The Site is located within the “Above the Hayward Fault” sub-basin in the Niles Subarea of the Fremont Groundwater Area (RWQCB, 2003). The Niles Sub-area encompasses the Alameda Creek watershed and the Niles Cone Groundwater Basin (“Niles Cone”). The Niles Cone is the alluvial fan formed by (a) Alameda Creek as it exits the Diablo Range and flows toward San Francisco Bay and (b) marine deposits from San Francisco Bay. Various aquifers of the Niles Cone may extend southward and westward beneath San Francisco Bay to the Palo Alto area.

The Hayward Fault divides the Niles Cone into eastern and western sub-basins and is a significant barrier to subsurface groundwater flow. The Site is located in the eastern sub-basin (i.e., east of the Hayward Fault) of the Niles Cone.

Based on interpretation of the borehole logs from EKI remedial investigations and those described in the *Phase II Environmental Site Assessment, Union Pacific Parcel, 37592 Niles Boulevard, Fremont, California*, prepared by Baseline Environmental Consulting (“BEC”), dated December 2000 (BEC, 2000), the Site appears to be underlain by fill materials with a typical thickness of approximately two to four feet. Fill material includes sand with gravel, with some clayey sands and sands with silt. The fill material is underlain by native material consisting of low-plasticity silty clay or silty sand. Groundwater is encountered at the Site at depths ranging from approximately 36 to 40 feet below ground surface (“bgs”). Based on groundwater elevations measured in four monitoring wells at the Site, the groundwater gradient direction is generally to the south, toward Alameda Creek.

2.2 Summary of Remedial Investigations at the Site

Available soil and groundwater data for the Site are summarized below. The distribution of chemicals in soil and groundwater and screening of analytical data using published reference values is described in Sections 2.3 and 3. Three phases of remedial investigations have been conducted on the Site as discussed below.

2.2.1 Underground Storage Tank Removal

The first phase of remedial investigations at the Site occurred in 1988 associated with the removal of four underground storage tanks (“USTs”) by UPRR. These investigations included collection of soil samples from beneath former locations of the four steel gasoline tanks and the installation of a groundwater monitoring well (MW-1) through the bottom of one tank excavation where there were indications of a release of petroleum hydrocarbons to soil. Groundwater monitoring was conducted at well MW-1 (Figures 3 and 4) from 1992 through 1996, and petroleum hydrocarbons were not detected (EKI, 2002).

Based on the UST removal and monitoring activities, Alameda County Water District (“ACWD”) issued a closure recommendation in December 1996. The California Regional Water Quality Control Board, San Francisco Bay Region (“RWQCB”) concurred in a letter dated 7 January 1997.

2.2.2 Remedial Investigations on Behalf of Fremont by Others

The second phase of investigations was performed prior to 2002 by TCG and BEC, working at the Site on behalf of Fremont. Sampling locations for these investigations are shown on Figure 3.

2.2.2.1 Phase I Environmental Site Assessment & Limited Phase II

The Phase I Environmental Site Assessment performed by TCG (TCG, 2000) indicated that the Site was developed prior to 1954 and is covered by typical railyard gravels and various pieces of railroad equipment. A small building and a shed related to the former uses of the Former UPRR Property remain on-Site. Four-point composite soil samples from 3 to 9 inches bgs were collected from the upper surface of fill material at the Site in ten sampling areas, labeled “A” through “J” (Figure 3). Soil samples were analyzed for a variety of chemicals including metals, volatile organic compounds (“VOCs”), polychlorinated biphenyls (“PCBs”), polynuclear aromatic hydrocarbons (“PAHs”), and chlorinated pesticides. Arsenic, cadmium, and lead were detected in composite soil samples at maximum concentrations of 130 milligrams per kilograms (“mg/kg”) (Area J),

110 mg/kg (Area F), and 540 mg/kg (Area F), respectively. Total petroleum hydrocarbons as diesel (“TPH-d”) were detected in a composite soil sample at a maximum concentration of 860 mg/kg (Area C). VOCs were not detected in any of the soil samples analyzed. PCBs (Aroclor 1260), benzo(b)fluoranthrene, and benzo(a)pyrene were detected in composite soil samples with maximum concentrations of 1.4 mg/kg (Area I), 0.78 mg/kg (Area G), and 0.49 mg/kg (Area G), respectively. Analytical results are summarized in Table 1.

2.2.2.2 Phase II Environmental Site Assessment

The Phase II Environmental Site Assessment performed by BEC (BEC, 2000) indicated that soil samples were collected at the Site from ten soil boreholes, designated “UP-1” through “UP-10” during October 2000 (Figure 3). The thickness of fill (i.e., the depth to native soil) ranged from 0.8 to 3.7 feet in the ten boreholes completed at the Site. Soil samples collected in the fill material contained concentrations of arsenic and lead with maximum concentrations of 260 mg/kg (UP-7, Area I) and 380 mg/kg (UP-1, Area A), respectively (Table 1). Samples of fill soil were analyzed for arsenic and lead using the Waste Extraction Test (“WET”), as shown in Table 2. The soluble concentration determined for extract from the WET test exceeded the soluble threshold limit concentration (“STLC”) of 5 milligrams per liter (“mg/L”) for arsenic in samples UP-5 and UP-7, and the STLC of 5 mg/L for lead in samples UP-1, UP-5, and UP-7. Concentrations of TPH-d and total petroleum hydrocarbons as motor oil (“TPH-mo”) were detected in sample UP-7 in Area I at maximum concentrations of 550 mg/kg and 1,900 mg/kg, respectively. Soil samples collected in the native soil contained concentrations of arsenic at a maximum concentration of 50 mg/kg (UP-5, Area G; Table 1).

2.2.3 Remedial Investigations on Behalf of Fremont by EKI

The third phase of investigations was performed on behalf of Fremont by EKI beginning in 2002 as part of the acquisition of the Site by Fremont. Sampling locations for these investigations are shown on Figures 4 and 5. The paragraphs below summarize EKI’s soil and groundwater investigations.

2.2.3.1 Summary of Soil Investigations Conducted at the Site by EKI

Soil investigations by EKI at the Site included: (1) collection of discrete and composite samples of shallow soil on grid patterns across the Site, (2) collection of soil samples from boreholes, (3) investigation of shallow stratigraphy at the Site using backhoe trenches, (4) collection of grab groundwater samples from open boreholes, (5) installation and sampling of groundwater monitoring wells, and (6) additional hydrogeologic investigations of Site stratigraphy using continuous borehole logging.

January 2002 Soil Investigations

Shallow soil samples were collected in January 2002 to investigate the presence and distribution of metals, TPH-d and TPH-mo, PCBs, semi-volatile organic chemicals (“SVOCs”), and chlorinated pesticides. Soil samples were collected on a grid system (Figure 5).

A total of 72 laterally distinct soil samples were collected from fill soil at a spacing of approximately 15 to 20 feet apart, at depths ranging between 0.5 and 2.0 feet bgs (EKI, 2003a). A total of 18 four-point composite soil samples were prepared by the analytical laboratory from the discrete soil samples. TPH-mo was detected in fill soil samples at concentrations ranging from 22 to 630 mg/kg. TPH-d was detected in fill soil samples at concentrations ranging from 9.6 to 220 mg/kg. Analytical methods and results for total petroleum hydrocarbons (“TPH”) are summarized on Table 3 and Figure 6. Metals were detected in each fill material sample, as summarized in Table 4 and on Figure 7. Arsenic concentrations in fill material ranged from below laboratory detection limits (<30 mg/kg) to a maximum of 260 mg/kg. Concentrations of SVOCs were not detected in samples of the fill material, and PCBs were occasionally detected as Aroclor 1260. Analytical methods and results for SVOCs and PCBs are summarized in Table 5. Concentrations of PCBs are shown on Figure 8. Chlorinated pesticides were detected in samples of the fill material as summarized on Table 5 and Figure 9.

A total of 10 exploratory soil boreholes, designated SB-1 through SB-5 and GW-1 through GW-5 were also completed at the Site to provide additional data regarding the depth of fill and to investigate the presence and distribution of chemicals of potential concern (“COPCs”) in native soil. Sample locations are shown on Figure 5. The analytical methods and results of soil samples collected from these boreholes are presented in Tables 3, 4, and 5 and on Figures 6, 7, 8, and 9. TPH-mo was detected at concentrations ranging from 78 to 580 mg/kg. TPH-d was detected at concentrations ranging from 3.2 to 230 mg/kg. Arsenic concentrations ranged from below laboratory detection limits (<30 mg/kg) to a maximum of 280 mg/kg. VOCs, SVOCs, PCBs, and chlorinated pesticides were not detected at significant concentrations (Section 2.3).

March 2003 Soil Investigations

During 26 and 27 March 2003, approximately 250 linear feet of trench were excavated in six locations (i.e., trenches UPT1 through UPT6) at the Site (Figure 10). Trenches UPT1, UPT2, UPT3, and UPT4 were located at the western end of the Site to provide characterization of the extent of chemical impact of shallow soil in areas that were previously uninvestigated. Trenches were excavated to a maximum depth of approximately 5 feet bgs. Trenches UPT3 and UPT6 were each constructed in two separate sections on either side of a known utility line (EKI, 2003b).

A total of 38 soil samples collected from the trenches were submitted for chemical analysis. The locations of the samples are shown on cross sections of the trenches on Figures 11, 12, and 13. To further characterize the fill soil in the western portion of the properties, a majority of the samples submitted for chemical analysis were collected from trenches UPT1, UPT2, and UPT3. Soil samples were analyzed for metals, TPH-d, TPH-mo, total petroleum hydrocarbons as gasoline (“TPH-g”), VOCs, SVOCs, PCBs, and chlorinated pesticides.

Soil samples were also collected and analyzed from a total of 10 soil boreholes located on City Lot 1 (CL1-1, CL1-2, and CL1-3) and City Lot 2 (CL2-1, CL2-2, CL2-3, CL2-4, CL2-5, CL2-6, and CF-2) in March 2003 (Figure 10). Three soil samples were collected from each borehole at depths of approximately 1 foot, 2.5 feet, and 5 feet bgs and analyzed for metals, TPH-d, TPH-mo, TPH-g, volatile organic compounds, SVOCs, PCBs, and/or chlorinated pesticides.

The concentrations of extractable petroleum hydrocarbons (i.e., TPH-d or TPH-mo) detected ranged from 25.3 mg/kg to 999 mg/kg (Figure 14). The maximum detected TPH concentration (999 mg/kg in sample UPT5-S-1.5) was collected from an asphalt layer encountered in the fill material in trench UPT5. Arsenic was detected at concentrations ranging from 3.49 mg/kg to 313 mg/kg. Concentrations of arsenic and other metals detected in soil samples are summarized in Table 4 and Figure 15. TPH-g, VOCs, SVOCs, PCBs, and chlorinated pesticides were not detected at significant concentrations (Table 5, Figures 16 and 17).

2.2.3.2 Summary of Groundwater Investigations Conducted at the Site by EKI

Groundwater investigations conducted at the Site by EKI include: (1) grab groundwater sampling from open boreholes and sampling existing monitoring well MW-1 during January 2002, (2) sampling newly-installed monitoring wells (CF-1, CF-2, and CF-3) and existing well MW-1 during March 2003, and (3) sampling monitoring wells CF-1, CF-2, CF-3, and MW-1 during March and October 2004. Monitoring well construction details are summarized in Table 6.

January 2002 Groundwater Investigation

During January 2002, on-Site grab groundwater samples were collected from three open boreholes (GW-1, GW-3, and GW-4) and from existing monitoring well MW-1 (Figure 5) and analyzed for metals, TPH-d, TPH-mo, TPH-g, VOCs, SVOCs, PCBs, and chlorinated pesticides (Tables 7 and 8). The purpose of this sampling was to assess the

lateral extent of COPCs, should they exist, in the water-bearing zone (i.e., at a depth of approximately 38 to 60 feet bgs) below the Site.

VOCs were not detected in these groundwater samples, with the exception of chloroform and toluene detected in the sample collected from open borehole GW-1 (Table 7). TPH was detected in the grab groundwater samples at concentrations ranging from 150 to 330 micrograms per liter (“µg/L”; Table 7). TPH was not detected in the groundwater sample collected from MW-1.

In each of these grab groundwater samples collected from soil boreholes, various metals were detected (Table 8). In contrast, barium was the only metal detected in the groundwater sample collected from permanent monitoring well MW-1. Grab groundwater sampling from open boreholes generally occurs following significant disturbance to the aquifer formation, including potential mixing of soil with groundwater, and samples are collected without any prior purging; therefore, grab groundwater samples may not be representative of static groundwater conditions. Due to these inherent differences, groundwater samples collected from permanent monitoring wells are generally considered to be representative of groundwater conditions.

March 2003 Groundwater Sampling

On 28 March 2003, groundwater samples were collected from the three newly-installed wells (CF-1, CF-2, and CF-3) and existing well MW-1. The samples were analyzed for metals, TPH-d, TPH-g, and VOCs (Tables 7 and 8). TPH-d, TPH-g, and VOCs were not detected at concentrations above laboratory reporting limits or the screening levels (Table 7). Arsenic and lead were not detected above the screening levels (Table 8).

2004 Groundwater Sampling for ACWD

Groundwater sampling was conducted during March 2004 and October 2004 (EKI, 2004a; EKI, 2004b). TPH and VOCs were not detected in the groundwater samples (Table 7). Arsenic, lead and other metals were detected at concentrations below the screening levels (Table 8).

2.2.3.3 July 2004 Hydrogeologic Investigations

At the request of ACWD, EKI conducted hydrogeologic investigations in the central portion of the Site during July 2004 to further evaluate the stratigraphy, soil type, and soil hydraulic conductivity in the area of a potential consolidation cell that is being considered as an alternative for managing Site soil containing COPCs. These investigations included drilling and continuous geologic logging of seven boreholes and

the collection of soil samples for laboratory analysis of particle size and hydraulic conductivity.

The results confirmed that three primary geologic units are present in the upper 50 feet bgs in the central area of the Site. Figures 18 through 21 provide cross sections updated with the July 2004 stratigraphy data. Figure 5 shows the location of each cross section.

The first (uppermost) unit consists of up to four feet of fill soil that has historically been placed across the Site. The fill varies in thickness from less than one foot to four feet and includes sandy silt, sand, sand with gravel, and clayey gravel variants.

The fill is underlain by a second unit, a generally fine-grained sequence of native silts and clays that extends to depths of approximately 45 feet bgs across most of the Site.

Beneath the approximate southern half of the Site, the silt and clay unit is underlain by the third unit, a native sand and gravel sequence interpreted as river channel sediments deposited in the geologic past by the equivalent of Alameda Creek. During the July 2004 investigation, the sand and gravel unit was encountered in boreholes GB-1, GB-2, and GB-4. It had previously been encountered in boreholes CF-1, GW-1, CF-2 and GW-3. None of the boreholes were drilled deep enough to penetrate completely through the sequence. The top of the sand and gravel unit ranges from 40 to 46 feet bgs. Generally, there are three to six feet of sand or silty sand at the top of the sand and gravel unit.

At the eastern end of the Site, a separate and distinct sand and gravel unit is observed (Figure 18). During the July 2004 investigation, this unit was encountered only in GW-4, though it had previously been encountered in borehole CF-3. The eastern sand and gravel unit seems to occur at a higher stratigraphic position relative to the sand and gravel unit to the west and the two units appear to be unconnected. The top of the eastern sand and gravel unit ranges from 18 to 24 feet bgs.

The approximate piezometric surface shown on Figures 18 through 21 was inferred from groundwater elevations measured in on-Site groundwater monitoring wells (Table 9). Groundwater at the Site is generally present between approximately 37 and 51 feet bgs, at an approximate elevation of 36 to 46 feet relative to the National Geodetic Vertical Datum of 1929, and the groundwater gradient is generally to the south, toward Alameda Creek. The hydraulic conductivity of the fine-grained soil in the upper 45 feet bgs is quite low in the central area of the Site. The average hydraulic conductivity of these fine-grained materials ranges from 7×10^{-9} to 1×10^{-7} centimeters per second ("cm/s"), as determined by laboratory testing.

2.2.3.4 QA/QC Evaluation for EKI Investigations

Quality Assurance/Quality Control ("QA/QC") reviews were conducted for each of the individual investigation events conducted by EKI. Laboratory QA/QC procedures for

these investigations consisted of evaluating the data on the basis of (a) test method requirements and (b) the laboratory's own internal quality control procedures.

The QA/QC analytical results were within (a) generally accepted laboratory QA/QC protocols and (b) requirements of the laboratory's internal quality control procedures. The data collected during these additional investigations are considered acceptable and useable for use in the human health risk evaluation and the feasibility study described in this RAP.

2.3 Distribution of Chemicals in On-Site Soil and Groundwater

The distribution of chemicals in on-Site soil and groundwater, based on an evaluation of environmental data collected for the Site (Section 2.2), is summarized below. The analytical data obtained during the limited investigations by TCG and BEC prior to 2002 are not discussed in detail below because subsequent investigations provided a larger, more recent, and more representative data set.

2.3.1 Chemicals in Soil

During 2002, TPH-mo and TPH-d were detected in 10 samples of fill material at concentrations above the environmental screening levels ("ESLs") defined by the RWQCB for residential land use. The ESLs (assuming groundwater is a drinking water source) for TPH-mo and TPH-d are 500 mg/kg and 100 mg/kg, respectively (RWQCB, 2005), as shown in Table 3. Refer to Section 3.1 for additional discussion of screening levels.

As shown in Table 4, arsenic was detected in all the soil samples at concentrations above the PRG for residential land use and above the CHHSL for residential land use for both cancer and non-cancer scenarios. There were 39 samples at concentrations above the non-cancer PRG of 22 mg/kg. These locations are shaded in Table 10 and highlighted on Figure 22, which summarizes the analytical results for arsenic concentrations detected in soil. Antimony was detected in a single discrete soil sample at a concentration above 31 mg/kg, the PRG for residential land use, and above 30 mg/kg, the CHHSL for residential land use. Cadmium was detected in three discrete samples at concentrations slightly above the CHHSL of 1.7 mg/kg but below the PRG of 37 mg/kg for residential land use. Lead was detected in 17 discrete samples at concentrations above the CHHSL of 150 mg/kg but below the PRG of 400 mg/kg for residential land use. Thallium was detected in three discrete soil samples at concentrations above the PRG of 5.2 mg/kg for residential land use and the CHHSL of 5 mg/kg for residential land use.

PCBs were detected in eight soil samples at concentrations below PRGs for residential land use, but in three soil samples at concentrations above CHHSLs for residential land use (Table 5). PCBs were detected at a maximum concentration of 0.20 mg/kg.

VOCs were not detected above laboratory reporting limits. Concentrations of SVOCs and chlorinated pesticides detected in soil samples were all below PRGs and CHHSLs for residential land use (Table 5).

In summary, other than TPH, metals, and PCBs, chemicals were not detected in soil samples at concentrations above PRGs or CHHSLs for residential land use. As shown in Table 3, TPH concentrations decrease dramatically (e.g., from several hundred mg/kg to concentrations below the analytical detection limit) as the soil profile descends from fill soil into the native soil horizon. The consistent nature of the TPH contamination in fill soil across the Site (Figures 6 and 14) contrasts with the native soil, which is relatively free of TPH contamination at the locations sampled.

In general, metals concentrations are present fairly consistently in samples collected from both fill and in native soil across the Site (see Table 4 and Figures 7 and 15). The exceptions are arsenic and lead, which are detected at elevated concentrations in the fill material relative to the native soil. To demonstrate this contrast, concentrations of arsenic detected in fill are plotted with concentrations of arsenic detected in native soil on Figure 23. Elevated arsenic and lead concentrations in the fill do not appear to have significantly moved into native soil. Other metals above screening levels are generally collocated with elevated concentrations of arsenic.

2.3.2 Chemicals in Groundwater

VOCs and metals are not present in Site groundwater at concentrations above Maximum Contaminant Levels (“MCLs”) (Tables 7 and 8). SVOCs, PCBs, and chlorinated pesticides have not been detected in groundwater samples collected at the Site. TPH has not been detected in groundwater samples collected from permanent monitoring wells at the Site (Section 2.2.3.2). Groundwater has not been impacted by the COPCs present in Site soil, as confirmed by groundwater samples collected from permanent monitoring wells (Section 2.2.3.2).

2.4 Sources of COPCs and Conceptual Site Model

This section summarizes the sources of COPCs as inferred from remedial investigations conducted at the Site. Refer to the prior discussion for additional information.

2.4.1 Source of COPCs

The primary source of COPCs detected in soil at the Site appears to be releases from the historical operations of UPRR on the Site. Groundwater has not been impacted by the

COPCs present in Site soil, as confirmed by groundwater samples collected from permanent monitoring wells (Section 2.2.3.2).

2.4.2 Conceptual Site Model

Key components of the conceptual Site model are:

A layer of fill soil approximately two to four feet thick covers the Site;

Fill soil is generally underlain by a relatively thick layer (approximately 40 feet) of fine-grained, low permeability silts and clay that cover the majority of the Site;

COPCs are primarily limited to the upper 3 to 5 feet of soil, and no substantial downward migration into native soil beneath the fill has been observed;

Groundwater is present at approximately 36 to 40 feet bgs; and

Despite the presence of COPCs in Site soil for several years or decades, recent monitoring results indicate that groundwater is not impacted.

The inferred geology beneath the Site is shown on geologic cross sections (Figures 18 through 21).

3 REMEDIAL ACTION OBJECTIVES

The first step in the evaluation of remedial approaches for the Site is development of RAOs. The RAOs for contaminated Site soil are intended to guide remedial actions that mitigate the identified potential threats to human health and the environment in a manner consistent with current and potential future uses of the Site.

This Section develops RAOs for the Site based on protection of human health and the environment. Potential risks to human health at the Site based on current conditions are evaluated in Section 3.1. The protection of groundwater quality at the Site is considered in Section 3.2. Applicable or relevant and appropriate requirements (“ARARs”) and “to be considered” (“TBC”) RAOs are discussed in Section 3.3. RAOs are described in Section 3.4. The numeric remedial goals selected for arsenic, lead, and TPH at the Site are described in Section 3.5.

3.1 Human Health Risk Evaluation

An evaluation of the potential risks to human health due to the chemicals detected in soil at the Site was performed by comparing data to PRGs and CHHSLs for residential land use (U.S. EPA, 2004b and Cal-EPA, 2005). PRGs and CHHSLs are based on direct contact pathways (i.e., ingestion, dermal contact, and inhalation) and combine current human health toxicity values with standard exposure factors to estimate contaminant concentrations in soil, air, and water that are considered by U.S. EPA Region IX to be health protective of human exposures, including sensitive groups, over a lifetime.

Fremont currently intends to develop the Site in two phases. Phase I will be the town square area which will be a public park with an orientation around the historic railroad uses of the Site. Phase II will be a mix of commercial, retail, recreational (park space), and urban residential units (e.g., apartments and condominiums) (Figure 24). When development is completed, the entire property will be covered with hardscape and limited softscape. The residential units are planned to be located on the second floor and above in a multi-story building, thus limiting the potential of exposure. Additionally, land use restrictions will be applied where soil will remain on-Site at concentrations above remediation goals (Section 3.5). The exposure assumptions used to develop the PRGs and CHHSLs for residential land use are considered somewhat more stringent and health protective than would be assumed for the actual intended mixed land use at the Site because volatile compounds are not COPCs at the Site, the development plan includes Site cover and residences in the second floor of multi-story buildings that will eliminate potential direct contact or particulate inhalation pathways, and a land use restriction will be in effect if chemicals are left in Site soils above remedial goals. Therefore, the PRGs

and CHHSLs are considered conservative screening criteria for chemicals in soil at the Site. A summary of screening levels identified for comparison to Site analytical data is provided in Table 11.

Arsenic is present in representative shallow soil samples across the Site at concentrations up to 313 mg/kg, which exceeds the most conservative PRG for residential land use (0.39 mg/kg) and the CHHSL for residential land use (0.7 mg/kg). The concentrations of naturally-occurring arsenic in soil in the San Francisco Bay Area are typically above these residential land use screening levels. Therefore, arsenic concentrations are compared to naturally-occurring background levels to develop cleanup goals. Lead was detected in soil samples at concentrations above the CHHSL for residential land use (150 mg/kg) but below the PRG for residential land use (400 mg/kg). Concentrations of lead that exceed CHHSLs for residential land use are generally collocated with elevated concentrations of arsenic (Table 4). As a result, a remedial alternative intended to remediate arsenic in soil will also generally address lead in Site soil.

Antimony was detected in one soil sample at 33 mg/kg, equaling the residential land use PRG of 33 mg/kg and exceeding the residential land use CHHSL of 30 mg/kg. Cadmium was detected in three discrete samples at concentrations slightly above the residential land use CHHSL of 1.7 mg/kg but below the residential land use PRG of 37 mg/kg. Thallium was detected in 3 soil samples at concentrations above the residential land use PRG of 5.2 mg/kg but below the residential land use CHHSL of 5 mg/kg. The samples containing the maximum detected concentration of thallium (40 mg/kg, SB-3-0.5) and cadmium (3.9 mg/kg, SB-3-0.5) are collocated with arsenic (Tables 4 and 10, Figure 22).

The PRG guidance document describes an additive approach for PRG-screening of sites with multiple pollutants (U.S. EPA, 2004a). However, the cumulative risk procedure is not applicable for the Site because (1) a limited number of COPCs other than arsenic (i.e., thallium and antimony) have been identified at the Site with concentrations at or above PRGs for residential land use, (2) no PRG exists for TPH in soil, and (3) COPCs other than arsenic are found only in isolated locations which are generally collocated with elevated arsenic concentrations. Therefore, arsenic is considered the remediation driver and primary COPC for the Site.

An assessment of the representative arsenic concentration in soil at the Site was made by calculating the 95% upper confidence limit (“UCL”) of the arithmetic mean of all arsenic data summarized in Table 4 and on Figure 22, which were collected from fill and native soil up to a depth of five feet bgs. The calculated 95% UCL for all available arsenic data is 89.9 mg/kg (see Table 12 for the data and statistical calculations). Since this 95% UCL calculated for arsenic is approximately 230 times higher than the residential PRG, which was developed at a target cancer risk level of 10^{-6} , the baseline human health risk for the Site due to arsenic, assuming residential land use and the same exposure parameters used to develop the PRGs, would be approximately 2.27×10^{-4} . This information suggests current conditions would not be deemed suitable for unrestricted residential land use.

The 95% UCL of the arithmetic mean of all lead data summarized in Table 4, collected from fill and native soil up to a depth of five feet bgs, was calculated in Table 13. This calculated 95% UCL for all available lead data is 133 mg/kg, which unlike arsenic, is much lower than the PRG for residential land use (400 mg/kg), and is lower than the CHHSL for residential land use (150 mg/kg). EKI utilized the DTSC Lead Risk Assessment Spreadsheet (“LeadSpread”) to assist in evaluating potential human health risks due to the presence of lead in Site soil. A copy of the LeadSpread assumptions applied to this Site is included in Appendix C. LeadSpread is a tool that is used to estimate blood lead concentrations resulting from exposure to lead via dietary intake, drinking water, soil and dust ingestion, inhalation, and dermal contact. Each of these pathways is represented by an equation relating incremental blood lead increase to a concentration in an environmental medium, using contact rates and empirically determined ratios. The potential contributions from the five pathways are added to arrive at an estimate of median blood lead concentration resulting from the multi-pathway exposure. Ninetieth, ninety-fifth, ninety-eighth, and ninety-ninth percentile concentrations are estimated from the median by assuming a log-normal distribution with a geometric standard deviation of 1.6. In applying LeadSpread, EKI used the default values provided by the DTSC for the concentration of lead in ambient air (0.028 micrograms per cubic meter, “ $\mu\text{g}/\text{m}^3$ ”), drinking water (15 $\mu\text{g}/\text{L}$), and respirable dust (1.5 $\mu\text{g}/\text{m}^3$). The DTSC default value for the percent of home grown produce for residential scenarios is 7% unless the potential for on-Site gardening is not applicable. Given the proposed future development of the Site as a public town square area or primarily hardscaped areas, produce is not likely to be grown on the Site, and this percentage was reduced to zero. As recommended by DTSC, EKI used the Site-specific calculated 95% UCL of 133 mg/kg for the “concentration of lead in soil/dust” to perform the LeadSpread calculations. Based on these input values and the standard exposure assumptions for residential land use, LeadSpread calculated 99th percentile Site-specific goals of 2,417 mg/kg and 255 mg/kg lead in soil for protection of blood lead concentrations for adults and children, respectively.

Considering that arsenic is the only COPC present throughout Site soil at levels exceeding both the residential land use PRGs and CHHSLs, and the preliminary estimate of potential cancer risk is approximately 2.27×10^{-4} and potential risks from lead exposure have been estimated using LeadSpread, a comprehensive baseline human health risk assessment for current conditions has not been prepared for the Site. The remaining portion of this RAP is focused on developing a plan for reducing potential human health risks at the Site by reducing the potential for exposure to contaminated soil and maintaining groundwater quality. Remedial goals for arsenic, lead, and TPH in Site soil are proposed in Section 3.5.1. Remediation goals are not proposed for antimony, cadmium, or thallium, due to infrequent detection above PRGs or CHHSLs in isolated locations, as described above.

No potentially complete exposure pathways are anticipated to exist following implementation of the remedial alternative recommended herein (Section 5). As a result,

no estimates of future human health risks following implementation of a remedial approach are provided.

3.2 Protection of Groundwater Quality

The U.S. EPA PRG table lists a soil screening level for arsenic based on migration to groundwater (leaching) of 1 mg/kg at an assumed dilution-attenuation factor (“DAF”) of 1.0 and 29 mg/kg at an assumed DAF of 20 (Table 11; U.S. EPA, 2004b)⁴. Given the depth to groundwater of approximately 36 to 40 feet bgs, and the low hydraulic conductivity of the native soil (i.e., 7×10^{-9} to 1×10^{-7} cm/s; see Section 2.2.3.3), a DAF of 20 or higher may be appropriate for the Site. While the arsenic concentrations in some soil samples collected at the Site exceed the soil PRGs based on groundwater protection, arsenic has not been found to be impacting groundwater quality at the Site under current conditions (see Section 2.3), despite the presence of arsenic in shallow soil at the Site for several years or decades.

TPH-d and TPH-mo have been detected in a few soil samples at the Site at concentrations exceeding screening levels for the protection of groundwater quality, as issued by the RWQCB (RWQCB, 2005). TPH is considered a COPC for the Site, and remedial goals are established in Section 3.5.3. However, as is the case with arsenic, TPH has not been found to be impacting groundwater quality at the Site under current conditions.

Concentrations of metals and TPH above screening levels were detected in early groundwater samples collected from open boreholes but these data likely reflect interference from suspended particles (Section 2.2.3.2). More recent groundwater samples collected from permanent monitoring wells contain concentrations of metals below the screening levels and no detections of TPH. Therefore, there has not been any impact to groundwater from historical Site activities.

3.3 Applicable or Relevant and Appropriate Requirements and “To Be Considered” Remedial Action Objectives

RAOs should “to the extent practicable considering the exigencies of the situation” be consistent with ARARs as described in 40 CFR Section 300.415(j). The definition of ARARs is contained in the NCP, set forth in 40 CFR Part 300 (U.S. EPA, 1993):

Applicable Requirements: Cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state law that

⁴ The table does not list soil screening levels for lead based on migration to groundwater (leaching).

specifically address a hazardous substance, pollutant, remedial action, location, or other circumstance at a site.

Relevant and Appropriate Requirements: Cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site.

ARARs typically are separated into three categories:

Chemical-specific ARARs: These are health-based or risk-based standards that define the allowable limits of specific chemical constituents found in or discharged to the environment. They can provide cleanup and discharge levels that can determine site remedial goals. Most chemical-specific ARARs are applicable to water sources potentially used for drinking water; few are available for ambient air or soil. MCLs for drinking water are examples of potential chemical-specific ARARs.

Location-specific ARARs: These requirements can apply to natural site features, such as wetlands, flood plains, or the presence of endangered species, and to man-made features and institutional factors, including landfills, city zoning requirements, and places of historical or archaeological significance. Location-specific ARARs restrict the types of remedial actions that can be implemented based on site-specific characteristics or location. Certain ARARs can be location-specific and action-specific; for example, regional well construction standards can restrict new water supply wells in certain areas, as well as govern the manner in which a groundwater well is constructed if such wells are part of an implemented remedy.

Action-specific ARARs: These ARARs are technology-based or activity-based limitations that can set performance and design restrictions. They specify permit requirements and engineering controls that must be instituted during site activities, or restrict particular activities.

Federal and state non-promulgated standards, policies, or guidance documents, and local requirements are not ARARs. However, according to the NCP guidance, these items are also to be considered when evaluating and selecting removal actions necessary to protect human health and the environment. These non-promulgated, non-binding factors are designated TBCs, by the NCP (40 CFR Part 300.400(g)(3); U.S. EPA, 1993).

Identified chemical-, location-, and action-specific ARARs and TBCs for the Site are listed in Table 14.

3.4 Remedial Action Objectives

The first step in the evaluation of remedial alternatives for the Site is development of RAOs. The RAOs for contaminated Site soil are intended to guide remedial actions that mitigate the identified potential threats to human health and the environment in a manner consistent with current and potential future uses of the Site.

At the Site, the only identified potential risks to human health or the environment are (a) the presence of arsenic in shallow soil above its PRG and CHHSL and above naturally occurring background concentrations, i.e., potentially allowing exposure to the arsenic through fugitive dust emissions or direct contact (see Section 3.1), (b) the presence of lead in shallow soil above protective levels estimated using LeadSpread, i.e., potentially allowing exposure to the arsenic through fugitive dust emissions or direct contact (see Section 3.1) and (c) the presence of TPH above ESLs in shallow soil, which may present a potential for impact to groundwater, although groundwater quality has not been impacted at the Site to date.

RAOs have been developed for the Site that are protective of human health and the environment, considering the future Site use, and consistent with the identified ARARs and TBCs. The RAOs for the Site are as follows:

Reduce or eliminate the potential for future exposure to soil containing arsenic at concentrations above naturally occurring background levels;

Reduce or eliminate the potential for future exposure to soil containing lead at concentrations above the Site-specific remediation goal calculated using DTSC's LeadSpread;

Perform the remedial action in a manner that is protective of air quality during remediation and groundwater quality following completion of the remedy; and

Facilitate future development of the property.

3.5 Remedial Goals Selected for Arsenic, Lead, and TPH in Soil

Remedial goals are established in this Section for arsenic, the primary COPC for the Site, as well as for lead and TPH. Remedial goals are not established for other COPCs based on the human health risk evaluation (Section 3.1).

3.5.1 Remedial Goal for Arsenic

For areas of the Site where there will be unrestricted residential land use, the proposed remedial goals for arsenic in Site soil are (a) a maximum concentration of 26 mg/kg

detected in a single soil sample, and (b) a 95% UCL of the arithmetic mean of 14 mg/kg. The potential remediation area that would be defined based on the arsenic remedial goals proposed herein is shown on Figure 25. The remediation depths and associated volumes of soil for grid cells that fall within the boundary of this defined remediation area are summarized in Table 15.

Site data were used to calculate the upper bound of the range of local background concentrations following a method in a DTSC guidance document (DTSC, 1997). The upper bound of the range of background concentrations identified by these calculations is 25.7 mg/kg, as shown in Appendix D. This calculated upper bound value was used as the basis for the 26 mg/kg maximum concentration remedial goal.

Concentrations of arsenic in Site soil outside the impacted fill soil layer range from 1.4 to 19.1 mg/kg. The 95% UCL of the arithmetic mean of arsenic in Site soil outside the potential remediation area shown on Figure 25 and based on the data summarized in Tables 10, 15, and 17 is approximately 10.3 mg/kg. A review of several technical references reporting screening criteria and typical metal concentrations in soil in California (Table 16) indicates that typical background concentrations of arsenic in California soils range from approximately 0.3 mg/kg to 69 mg/kg. DTSC has agreed to use the 14 mg/kg average concentration remedial goal for the Site because it is consistent with arsenic remedial goals established for other sites in the Bay Area where DTSC has provided oversight of cleanups prior to residential development, including two nearby sites in Union City. The 14 mg/kg remedial goal will also be used as a criterion for determining the acceptability of fill material that is imported from off-site sources to backfill areas that are excavated during the cleanup. This remedial goal will allow some flexibility in using fill materials from different sources in the Bay Area with variable concentrations of naturally-occurring arsenic.

Groundwater beneath the Site is currently not impacted with arsenic (Table 8). As such, leaving arsenic in surface soil at concentrations below an average of 14 mg/kg is also considered protective of groundwater quality.

3.5.2 Remedial Goal for Lead

Although concentrations of lead in Site soil are lower than the PRG for residential land use, DTSC's LeadSpread was used to as a conservative measure to develop a Site-specific remedial goal. The selected remedial goal for lead in surface soil at the Site is 255 mg/kg, which corresponds to the 99th percentile soil goal for residential land use and protection of both children and adults, calculated using LeadSpread. This remedial goal is believed to be protective of human health and the environment because the exposure assumptions used in DTSC's LeadSpread are considered conservative and protective for residential land use. Only four Site soil samples contained lead above the proposed remedial goal, and the 95% UCL of the arithmetic mean of all lead data presented in Table 4, including these four samples above the remedial goal, was 133 mg/kg (Section 3.1), which is significantly below the proposed goal, as well as below the PRG

and CHHSL for lead. Additionally, elevated concentrations of lead (concentrations > 255 mg/kg) are limited to the upper five feet of soil (Tables 10 and 15), and the lead is not highly mobile and is not migrating downward to groundwater. In areas planned for limited residential development (only above the second floor of a multi-story building) and in the town square area, soil containing arsenic above the remediation goal will be excavated and replaced with clean imported soils. Therefore, after remediation, soil below residential development will meet the remedial goals. Lead is not a volatile chemical and therefore an exposure through inhalation of vapors is not of concern. Site surfaces will be covered with hardscape or limited softscape, which eliminates potential exposure pathways.

3.5.3 Remedial Goals for TPH

In the absence of PRGs and CHHSLs for TPH, the ESLs (RWQCB, 2005) of 100 mg/kg for TPH-d and 500 mg/kg TPH-mo are selected as remedial goals for the Site. These ESLs are published by the RWQCB for TPH compounds for (1) residential land use, (2) shallow soils (i.e., up to 3 meters bgs), and (3) locations where groundwater is considered a drinking water source.

The ESLs are considered conservative goals for protection of groundwater quality at the Site given that (a) groundwater has not been impacted by TPH at the levels detected in soil at the Site despite the likely release of this TPH to soil several years or decades earlier, and (b) TPH has been detected above the ESLs only sporadically across the Site, and therefore is less likely to result in migration to groundwater relative to a site where TPH is present over a larger area.

The assumptions used by the RWQCB for development of ESLs are consistent with Site characteristics, and ESLs are appropriate for application at the Site. The RWQCB indicates that the ESLs for petroleum hydrocarbons (1) are driven by the protection of groundwater quality, and less stringent ESLs may be warranted where groundwater monitoring demonstrates that actual impacts to groundwater are insignificant, and (2) use of ESLs as final cleanup levels may be unnecessarily conservative for highly degradable compounds such as petroleum hydrocarbons (RWQCB, 2005).

4 FEASIBILITY STUDY

A feasibility study for remediation of contaminated Site soil is presented in this Section, which was prepared in substantial accordance with the NCP and reflects the following guidance documents published by Cal-EPA and U.S. EPA:

Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”): Interim Final, U.S. Environmental Protection Agency Document No. EPA/540/G-89/004, October 1988 (U.S. EPA, 1988);

The Role of Cost in the Superfund Remedy Selection Process, U.S. Environmental Protection Agency, Document No. EPA/540/F-96/018, September 1996 (U.S. EPA, 1996); and

Remedial Action Plan (RAP) Policy, State of California, Environmental Protection Agency, Department of Toxic Substances Control, Document Number EO-95-007-PP, 16 November 1995 (DTSC, 1995).

4.1 Screening of Technologies and Process Options

Section 4.1.1 below discusses general response actions, which are broad categories of remedial alternatives that could potentially be implemented to address the RAOs established in Section 3.4. Within each general response action category, specific technologies are screened as discussed in Section 4.1.2. Technologies and process options not screened out at this stage will be carried further in the development of remedial alternatives described in Section 4.2.

4.1.1 General Response Actions

General Response Actions are broad categories of remedial alternatives, some of which may clearly not be pertinent to the site-specific conditions and goals. These general categories consist of:

No Action: The NCP requires that a “No Action” alternative be included in the remedial alternative evaluation.

Institutional Actions: The NCP provides that a combination of methods may be used to achieve protection of human health and the environment. Engineering controls can be combined with institutional controls, as appropriate, for treatment residuals and untreated waste. Institutional controls, such as water use restrictions or deed restrictions, can be used to supplement engineering controls to limit exposure to hazardous substances.

Soil Remediation Alternatives: Soil remedial alternatives include a wide range of containment and disposal actions and technologies or alternatives to remove or destroy contaminants.

4.1.2 Identification and Initial Screening of Technologies and Process Options

Table 18 summarizes the initial screening of process options and remedial technologies for the Site. Based on the screening results, the following process options and technologies were selected and are included within remedial alternatives for detailed evaluation in Section 4.2:

No Action

Institutional Actions:

- Groundwater Monitoring
- Deed restriction
- Maintenance of Temporary Cover and Perimeter Fence

Soil Remediation Actions:

- Excavation of Contaminated Soil with Off-Site Disposal
- Excavation of Contaminated Soil with On-Site Consolidation

4.2 Development of Remedial Alternatives

The remedial alternatives and technologies retained during the screening-level evaluation (Section 4.1) were assembled into the following five comprehensive remedial alternatives for further evaluation:

Remedial Alternative A: No Action

Remedial Alternative B: Maintenance of Cover and Fence, Groundwater Monitoring, and Institutional Controls

Remedial Alternative C (including two phases): Phase I - Soil Excavation With Off-Site Disposal, and Phase II - Focused Soil Excavation with Off-Site Disposal, Maintenance of Site Cover, and Institutional Controls

Remedial Alternative D: Comprehensive Soil Excavation and Off-Site Disposal

Remedial Alternative E: Comprehensive Soil Excavation and On-Site Consolidation with Maintenance of Site Cover and Institutional Controls

These five remedial alternatives are described in Section 4.4 below.

4.3 Remedial Alternatives Evaluation Criteria

The remedial alternatives developed in Section 4.2 are evaluated in Section 4.4 using nine federal evaluation criteria set forth in the NCP and six state evaluation criteria required by the CHSC §25356.1(d).

4.3.1 Federal Evaluation Criteria

The nine federal criteria, described below, are divided into three general categories: (1) Threshold Criteria, (2) Primary Balancing Criteria, and (3) Modifying Criteria. Threshold Criteria are actually requirements; that is, the selected remedial alternative must protect human health and the environment and must comply with identified ARARs.

4.3.1.1 Threshold Criteria

The Threshold Criteria category includes (a) Overall Protection of Human Health and the Environment and (b) Compliance with ARARs, TBCs, and RAOs.

Overall Protection of Human Health and the Environment

This criterion addresses whether a proposed remedial alternative is protective of human health and the environment, considering long-term and short-term site-specific characteristics. The remedy's long-term effectiveness and permanence, short-term effectiveness, and ability to reduce chemical toxicity, mobility, and volume affect the evaluation of the overall performance of each alternative under this criterion. Typically, assessment of overall protection from groundwater chemical exposure is based largely on the degree of certainty that an alternative can achieve progress toward meeting the site-specific RAOs.

Compliance with ARARs, TBCs, and RAOs

The selected remedy must comply with all ARARs, TBCs, and RAOs as described in Section 3.

4.3.1.2 Primary Balancing Criteria

The Primary Balancing Criteria category includes (a) Long-Term Effectiveness and Permanence, (b) Reduction of Mobility, Toxicity, or Volume, (c) Short-Term Effectiveness, (d) Implementability, and Cost.

Long-Term Effectiveness and Permanence

This criterion addresses how well a remedy is projected to maintain protection of human health and the environment, including after RAOs have been initially met. Components to be addressed include the magnitude of anticipated residual risks and the adequacy and long-term reliability of management controls.

Reduction of Mobility, Toxicity, or Volume

This criterion evaluates an alternative remedial action's ability to reduce toxicity, mobility, or volume of contaminants. Factors to be considered under this criterion include the following (U.S. EPA, 1993):

Treatment of recycling processes and the materials they would treat;

Amount of hazardous substances, pollutants, or contaminants destroyed, recycled or treated;

Degree of expected reduction in toxicity, mobility, or volume of waste due to treatment or recycling and specifications by which the reductions are occurring;

Is the treatment irreversible;

Type and quantity of residuals that remain following treatment, considering persistence, toxicity, mobility, and propensity of contaminants to bioaccumulate; and

The degree to which the treatment reduces the hazards posed by the principal threats at the Site.

Short-Term Effectiveness

This criterion assesses protection of human health and the environment during implementation of the remedial action and shortly thereafter. To be considered are the

length of time required to achieve protection, the short-term reliability of remedial technologies, protection of workers and the community during construction, and potential disruptions to exposed populations; that is, short-term environmental impacts.

Implementability

Implementability is assessed by considering the technical and administrative feasibility of each alternative as well as the availability of needed goods and services. Other considerations include the ability to construct and operate remedial facilities, ease of undertaking additional remedial actions, ability to monitor remedial effectiveness, and ability to obtain approvals and permits.

Cost

Capital costs include design and construction costs and costs for initial implementation of institutional controls. Operation and Maintenance (“O&M”) costs include annual outlays for monitoring and maintenance.

4.3.1.3 Modifying Criteria

The final NCP category, Modifying Criteria, is intended to incorporate input from State agencies and local residents into the alternative selection process. Typically, these two criteria are evaluated based on formal comments received during a project comment period. However, a formal comment period has not yet occurred. The following discussion of modifying criteria is therefore reflective only of informal comments received from DTSC staff.

State Acceptance

This criterion considers the State’s position and key concerns related to the alternatives and the State’s comments on the ARARs or the proposed use of waivers.

Community Acceptance

This criterion includes providing the community the opportunity to review and provide comments on the support or opposition of the presented remedial alternatives.

4.3.2 State Evaluation Criteria

CHSC §25356.1(e) requires that RAPs “shall include a statement of reasons setting forth the basis for the removal and remedial actions selected.” The Statement of Reasons “shall also include an evaluation of the consistency of the removal and remedial actions proposed by the plan with the federal regulations and factors specified in

subdivision (d)...” Subdivision (d) specifies six factors against which the remedial alternatives in the RAP must be evaluated. The RAP has addressed all these factors in detail for the selected alternative in the Statement of Reasons (Appendix E); a brief summary of each of the six factors follows.

Health and Safety Risks Posed by Site Conditions

This criterion considers the health and safety risks posed by specific Site conditions, which includes review of scientific data and reports related to the Site.

Effect of Contamination upon Beneficial Uses of Resources

This criterion evaluates the effect of contamination or pollutant levels upon present, future, and probable beneficial uses of threatened resources.

Effect on Groundwater Resources

This criterion evaluates the effect of remedial alternative action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses.

Site-Specific Characteristics

This criterion considers site-specific characteristics, including the potential for off-Site migration of chemicals of concern, surface and subsurface soil, hydrogeologic conditions, and pre-existing background contamination levels.

Cost Effectiveness

According to the CHSC, this factor evaluates the cost-effectiveness of alternative remedial action measures, including total long-term and short-term costs.

Potential Environmental Impacts of Remedial Action

The final CHSC criterion evaluates potential environmental impacts of alternative remedial action measures.

4.4 Detailed Evaluation of Remedial Alternatives

Each of the five Remedial Alternatives developed for the Site are described below and evaluated according to the Federal and State criteria presented in Section 4.3.

4.4.1 Remedial Alternative A: No Action

Remedial Alternative A consists of no action at the Site. This alternative is retained for evaluation as required by the NCP. The No Action alternative provides a baseline for comparing other alternatives. For this alternative, groundwater monitoring would cease at the Site, the monitoring wells would be abandoned, and no maintenance of the existing Site cover materials or fence would be performed. Under this alternative, the Site would remain unsuitable for future development since contamination would remain at concentrations posing a significant human health risk.

4.4.1.1 Federal Criteria Evaluation for Remedial Alternative A

Remedial Alternative A is evaluated below according to the Federal criteria described in Section 4.3.1.

Overall Protection of Human Health and the Environment

This alternative provides no protection of human health and the environment because no additional steps would be taken to mitigate risks associated with the contaminants.

Compliance with ARARs, TBCs, and RAOs

This alternative does not comply with ARARs, TBCs, and RAOs because the Site remains as it currently exists. Contaminated soil that poses an unacceptable risk to human health and the environment would remain in place and there would be no measures implemented to prevent human exposure to or migration of contaminants. This alternative would not comply with state and federal regulations that require cleanup of contaminated soil.

Long-Term Effectiveness

This alternative is not effective because no action would be taken to remediate the contaminated soil, nor would any measures be taken to mitigate the release of contaminants to the environment. Therefore this alternative would not be effective long-term.

Reduction of Mobility, Toxicity, or Volume

There is no reduction of mobility, toxicity, or volume under this alternative.

Short-Term Effectiveness

Because this alternative would not require additional steps to implement, there would be no construction issues associated with this alternative. No measures would be taken to achieve the RAOs, so there would be no associated timeframe for their achievement.

Implementability

This alternative would be implementable as it does not require any action. However, it would not be implementable from an administrative perspective, because regulations require further mitigation of potential risks.

Cost

There are no costs associated with this alternative.

Regulatory Agency and Community Acceptance

It is likely that this alternative would not be accepted by the regulatory agencies or the community members, because some action is required to mitigate the potential risks.

4.4.1.2 State Criteria Evaluation for Remedial Alternative A

Remedial Alternative A is evaluated below according to the State criteria described in Section 4.3.2.

Health and Safety Risks Posed by Site Conditions

This alternative provides no reduction of health and safety risks because no additional steps would be taken to mitigate risks associated with Site contaminants.

Effect of Contamination upon Beneficial Uses of Resources

This alternative would result in continued loss of beneficial use of the land resource because the Site remains as it currently exists. Contaminated soil that poses an unacceptable risk to human health and the environment would remain in place and there would be no measures implemented to prevent human exposure to or migration of contaminants. There is no loss of beneficial use of groundwater, as groundwater is not impacted by Site contaminants.

Effect on Groundwater Resources

This alternative is protective of groundwater resources because no groundwater impact has resulted from the presence of contaminants in Site soil during the past years or decades.

Site-Specific Characteristics

This alternative could result in potential off-Site migration of contaminants in fugitive dust because the existing cover would deteriorate and no maintenance would be performed.

Cost Effectiveness

There are no costs associated with this alternative.

Potential Environmental Impacts of Remedial Action

Alternative A does not include remedial action; therefore, there are no potential environmental impacts.

4.4.2 Remedial Alternative B: Maintenance of Existing Cover and Fence, Groundwater Monitoring, and Institutional Controls

Remedial Alternative B consists of maintenance of existing cover materials (crushed asphalt) and fencing, periodic groundwater monitoring, and implementation of institutional controls at the Site. The existing cover materials and perimeter fencing would be inspected on a monthly basis with an annual report to DTSC and maintained as necessary. Groundwater would be monitored annually at the four existing monitoring wells. Groundwater samples would be analyzed for metals and TPH, and a report of monitoring results would be submitted to DTSC following each groundwater monitoring event, which would be described further in the O&M and Soil Management Plan prepared for this alternative. Additionally, Alternative B would include a progress review with the DTSC on a 5-year interval in order to re-evaluate the effectiveness and protectiveness of Alternative B. This review would be conducted consistent with the U.S. EPA Comprehensive Five-Year Review document dated June 2001 and produced by the Office of Emergency and Remedial Response authorized by CERCLA (U.S. EPA, 2001) and would be conducted every five years as long as contaminated soil remains on-Site.

Institutional controls would also be implemented under Remedial Alternative B. These would include a deed restriction to (a) limit activity to include only vehicle parking in the area of the Site where COPCs are above the remedial goals, and (b) require hazardous materials trained contractors if any subsurface work will be performed in the soil in the area of the Site where COPCs are above remedial goals.

4.4.2.1 Federal Criteria Evaluation for Remedial Alternative B

Remedial Alternative B is evaluated below according to the Federal criteria described in Section 4.3.1.

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment because exposures to hazardous substances onsite would be prevented by maintaining the Site cover and fence and placing deed restrictions.

Compliance with ARARs, TBCs, and RAOs

This alternative would comply with ARARs and TBCs, but would not achieve the RAO of facilitating future development of the Site. Title 22, California Code of Regulations (“CCR”), Section 67391.1, which specifies that a land use covenant imposing appropriate limitations on land use shall be executed and recorded when hazardous substances will remain at a property at levels which are not suitable for unrestricted use of the land.

Long-Term Effectiveness

Breaching of the temporary Site cover and the fence or inadequate maintenance of the cover and fence could result in exposure to contaminants. This alternative would not achieve the RAO of facilitating future development of the Site.

Reduction of Mobility, Toxicity, or Volume

Since the contaminated soil would be left in-place, the toxicity and the volume of contaminants would remain the same. Mobility of COPCs in Site soil would not be reduced by maintaining the existing crushed rock cover.

Short-Term Effectiveness

Because this alternative would not require field work that would disturb the contaminated soil, there would be no construction issues associated with this alternative. This alternative would not achieve the RAO of facilitating future development of the Site.

Implementability

Labor, materials, and equipment for maintaining the cover and fence and sampling the groundwater monitoring wells are readily available.

Cost

The preliminary cost estimate for Remedial Alternative B is \$900,000, including the estimated present worth cost of an assumed 30 years of annual maintenance and monitoring and 5 years of groundwater monitoring to confirm that groundwater is not contaminated (see Table 19). The present worth cost was calculated assuming discount rates (i.e., inflation rates) of 2.6% for a 5-year term or 3.0% for a 30-year term (OMB, 2006).

Regulatory Agency and Community Acceptance

It is likely this alternative would not be accepted by the regulatory agencies because the temporary cover and fence are not permanent measures. This alternative would likely not be acceptable to the community members because the contamination is left in-place with crushed asphalt cover.

4.4.2.2 State Criteria Evaluation for Remedial Alternative B

Remedial Alternative B is evaluated below according to the State criteria described in Section 4.3.2.

Health and Safety Risks Posed by Site Conditions

This alternative would reduce health and safety risks by establishing an institutional control such as a land use restriction and implementing maintenance of the existing Site cover to prevent exposure to contaminants.

Effect of Contamination upon Beneficial Uses of Resources

This alternative would result in continued loss of beneficial use of the land resource because the Site remains as it currently exists. Contaminated soil that poses an unacceptable risk to human health and the environment would remain in place and there would be no measures implemented to prevent human exposure to or migration of contaminants. There is no loss of beneficial use of groundwater, as groundwater is not impacted by Site contaminants.

Effect on Groundwater Resources

This alternative is protective of groundwater resources because no groundwater impact has resulted from the presence of contaminants in Site soil during the past years or decades.

Site-Specific Characteristics

This alternative would reduce potential off-Site migration of contaminants in fugitive dust because the existing cover would be maintained.

Cost Effectiveness

Costs are considered moderate, as described above.

Potential Environmental Impacts of Remedial Action

Alternative B does not include remedial action; therefore, there are no potential environmental impacts.

4.4.3 Remedial Alternative C (including two phases): Phase I - Soil Excavation with Off-Site Disposal, and Phase II - Focused Soil Excavation with Off-Site Disposal, Maintenance of Site Cover, and Institutional Controls

Remedial Alternative C would be completed in two phases. Phase I includes remediation and development of the town square area (Figure 24), and Phase II would include additional remediation and development of commercial/residential properties on the remainder of the Site, outside the town square area. Figure 26 shows the Phase I and Phase II areas.

Phase I and Phase II of Remedial Alternative C are described as follows:

Phase I would include excavation of soil with contaminant levels above the remedial goals in the town square (i.e., Phase I) area of the proposed redevelopment, which would be used for recreational activities (Figure 26). The excavation area for Phase I is approximately 47,000 square feet (Figure 27), which is equivalent to approximately 7,100 tons of soil based on the calculated quantities presented in Table 15. Upon completion of the excavation, confirmation soil samples would be collected from the sidewalls and bottom of the excavation to confirm removal of soil that exceeds the remedial goals for arsenic, lead, and TPH. Soil excavated during Phase I would be disposed of off-Site to permitted facilities.

Phase II would include excavation of soil with contaminant levels above the remedial goals only below building footprints, utility corridors, and planting areas. Soil containing COPCs above remedial goals outside of these areas would be covered with redevelopment materials including hardscape and limited areas of softscape to reduce the potential for exposure in these areas (Figure 27). The total potential remediation area within Phase II is estimated at approximately 131,000 square feet (Figure 27). It is assumed that approximately 40 percent or 52,400 square feet of this soil would be located below building footprints, utility corridors, and planting areas. This is equivalent to

approximately 9,600 tons of soil based on the calculated quantities presented in Table 15. Soil excavated from the Phase II area is planned to be disposed off-Site to permitted facilities. Cover materials would be required only in those Phase II areas where soil containing COPCs above remedial goals remains in place, and groundwater monitoring would not be needed. These cover materials in the Phase II area would be inspected and maintained periodically. Phase II would also include deed restriction applied to areas containing COPCs above remedial goals to (a) limit activity to commercial or industrial land use or vehicle parking and similar activities, and (b) require hazardous materials trained contractors if any subsurface work would be performed in the soil containing COPCs above remedial goals. These activities would be described in an O&M and Soil Management Plan. Phase II of Alternative C would include a progress review with the DTSC on a 5-year interval in order to re-evaluate the effectiveness and protectiveness of Alternative B. This review would be conducted consistent with the U.S. EPA Comprehensive Five-Year Review document dated June 2001 and produced by the Office of Emergency and Remedial Response authorized by CERCLA (U.S. EPA, 2001) and would be conducted every five years as long as contaminated soil remains on-Site. Alternatively, Fremont may choose to excavate and dispose of all soil containing COPCs above remedial goals, thereby eliminating the need for inspection, monitoring, maintenance, reviews, the O&M and Soil Management Plan, and land use restrictions. The Phase II component of the proposed Alternative C is conceptual and will be described in additional detail during the Remedial Design phase (described in Section 5). The final remedial design for Phase II will include a detailed cost estimate comparing the overall costs of leaving soils in place as compared to removal of all soils. If the cost of removal is less than that of leaving in place, the soils will be removed from the Site and disposed at a permitted facility.

4.4.3.1 Federal Criteria Evaluation for Remedial Alternative C

Remedial Alternative C is evaluated below according to the Federal criteria described in Section 4.3.1.

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment because the removal of contaminated soil from the Phase I area and portions of the Phase II area eliminates the risk of exposure to hazardous substances, and covering the contaminated soil on the Phase II area prevents exposure to the hazardous substances.

Compliance with ARARs, TBCs, and RAOs

This alternative would comply with ARARs, including Title 22, CCR Section 67391.1, which specifies that a land use covenant imposing appropriate limitations on land use

shall be executed and recorded when hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land. This alternative would comply with local agency requirements, such as a grading permit from the Alameda County, Building Inspection Department.

Long-Term Effectiveness

This alternative is effective because it would eliminate long-term exposure to contaminated soil by (a) removal of contaminated soil to approved off-Site landfills, and (b) covering the remaining contaminated soils with hardscape or limited softscape, and (c) placing deed restrictions on these areas where soil contains COPCs above remedial goals.

Reduction of Mobility, Toxicity, or Volume

The volume of contaminated soil in the Phase I and Phase II areas at the Site would be reduced by removal and disposal of soil at an appropriate landfill where its mobility and toxicity would be reduced through pretreatment or containment. Covering the remaining contaminated soil in the Phase II area with hardscape and/or limited softscape would reduce contaminant mobility but toxicity and volume of in-place soil would not be reduced.

Short-Term Effectiveness

Phase I of this alternative would be effective and meet RAOs in the short-term, and Phase II would be effective and meet RAOs over a longer period of time. Potential short-term risks for this alternative include generation of air-borne contaminants in dust, and physical hazards from construction equipment. However, these short-term risks would be addressed by preparation and implementation of a Health and Safety Plan and an Air Monitoring Plan that would specify engineering and administrative controls, such as dust suppression, when needed. Air action levels that are protective of workers and the public would be included in an Air Monitoring Plan to address contaminants that may be released into air during excavation and off-Site disposal. Air monitoring protocol would be included where applicable in the Health and Safety Plan and an Air Monitoring Plan.

Implementability

Remedial Alternative C can be implemented using standard construction methods. Labor, materials, and equipment for excavating, removing, and covering the contaminated soil are readily available.

Cost

The preliminary cost estimate for Remedial Alternative C is \$4.3 million, assuming that all soil excavated during Phase I and Phase II would be disposed off-Site. This disposal

estimate assumes that 85% of the soil excavated will be classified as California hazardous waste but not a Resource Conservation and Recovery Act (“RCRA”) hazardous waste, and would be disposed untreated at an out-of-state landfill. Soil to be excavated during remediation activities will be sampled and evaluated to determine the appropriate waste classification(s) for off-Site disposal. This preliminary cost estimate includes the estimated present worth cost of an assumed 30 years of annual maintenance of Site cover and fencing for Phase II (see Table 20). Costs for covering versus removal of soils in Phase II will be evaluated at the time of the remedial action. If it is demonstrated that removal is a cost effective option, soils will be removed from the Site.

The present worth costs were calculated assuming discount rates (i.e., inflation rates) of 2.6% for a 5-year term or 3.0% for a 30-year term (OMB, 2006).

Regulatory Agency and Community Acceptance

It is likely that this alternative would be accepted by the regulatory agencies and the community members because action is taken to mitigate the potential risks and RAOs would be achieved.

4.4.3.2 State Criteria Evaluation for Remedial Alternative C

Remedial Alternative C is evaluated below according to the State criteria described in Section 4.3.2.

Health and Safety Risks Posed by Site Conditions

Phase I and off-Site disposal of soil during Phase II of this alternative would provide the most protective reduction of health and safety risks by removing contaminants from the Site. Covering contaminated soil left in place during Phase II would reduce the health and safety risks by establishing an institutional control such as a land use restriction and implementing maintenance of the existing Site cover to prevent exposure to contaminants. Health and safety risks during remediation activities would be managed by implementation of a Site-specific Health and Safety Plan.

Effect of Contamination upon Beneficial Uses of Resources

This alternative would regain the beneficial use of the land resource for the Site. There is no loss of beneficial use of groundwater, as groundwater is not impacted by Site contaminants.

Effect on Groundwater Resources

This alternative is protective of groundwater resources because no groundwater impact has resulted from the presence of contaminants in Site soil during the past years or

decades, and the proposed remedial actions would not result in increased risk to groundwater.

Site-Specific Characteristics

This alternative would reduce potential off-Site migration of contaminants in fugitive dust because contaminants would be removed or controlled through maintenance of cover materials in the Phase II area.

Cost Effectiveness

Costs are considered high, as described above.

Potential Environmental Impacts of Remedial Action

This alternative would not result in additional long-term environmental impacts. Potential air quality issues during remedial actions would be addressed by preparation and implementation of an Air Monitoring Plan and a Health and Safety Plan, as described above. Temporary increases in traffic and noise would be managed by implementation of a Transportation Plan.

4.4.4 Remedial Alternative D: Comprehensive Soil Excavation and Off-Site Disposal

Remedial Alternative D consists of excavation of soil from the areas of the Site where the arsenic, lead and TPH concentrations exceed the remedial goals (Section 3.5), with disposal of the excavated soil off-Site. Clean fill would be imported to the Site to provide an acceptable grade for future Site use. Confirmation soil samples would be collected from the sidewalls and bottom of the excavated areas prior to or following excavation to confirm the removal of soil containing arsenic, lead, and TPH above remedial goals.

Specific soil sample locations included in the area potentially requiring excavation are shaded in Table 10. The assumed extent of soil excavation under Remedial Alternative D would be the shaded area shown on Figure 25, which is approximately 178,000 square feet. The extent of soil excavation was developed by evaluating the arsenic, lead and TPH data in each investigation cell at the Site and comparing the data to the remedial goals. The full volume of soil summarized in Table 15 would be excavated, which would remove all locations identified in Table 10 where COPCs are above remedial goals. The estimated volume of soil potentially requiring excavation is approximately 18,300 bank cubic yards (“bcy”), which is estimated to be equivalent to approximately 31,100 tons (Table 15). Quantities presented in this RAP are estimated and may vary based on future conditions and data.

Excavated soil would be transported to an off-Site permitted landfill(s) for disposal. Prior to disposal, waste characterization and classification would be performed for appropriated disposal of contaminated soils in accordance with applicable laws and regulations.

4.4.4.1 Federal Criteria Evaluation for Remedial Alternative D

Remedial Alternative D is evaluated below according to the Federal criteria described in Section 4.3.1.

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment because the removal of contaminated soil eliminates the risk of exposure to hazardous substances.

Compliance with ARARs, TBCs, and RAOs

This alternative would comply with ARARs and local agency requirements, such as a grading permit from the Alameda County, Building Inspection Department.

Long-Term Effectiveness

This alternative is effective because it would eliminate long-term exposure to contaminated soil by removal of contaminated soil to one or more approved off-Site landfill facilities.

Reduction of Mobility, Toxicity, or Volume

The volume of contaminated soil that remains at the Site would be reduced through removal of all soil with arsenic, lead and TPH above the remedial goals. The soil would be disposed at an appropriate landfill where its mobility would be reduced through pretreatment. Therefore, removal and off-Site disposal would reduce the on-Site volume, and treatment and placement of these materials in a permitted facility would reduce the mobility of the chemicals.

Short-Term Effectiveness

This alternative would be effective and meet RAOs in the short-term. Potential short-term risks for this alternative include generation of air-borne contaminants in dust, and physical hazards from construction equipment. However, these short-term risks would be addressed by preparation and implementation of a Health and Safety Plan and an Air Monitoring Plan that would specify engineering and administrative controls, such as dust

suppression, when needed. Air action levels that are protective of workers and the public would be included in an Air Monitoring Plan to address contaminants that may be released into air during excavation and off-Site disposal. Air monitoring protocol would be included where applicable in the Health and Safety Plan and an Air Monitoring Plan.

Implementability

Remedial Alternative D can be implemented using standard construction methods. Labor, materials, and equipment for excavating and removing the contaminated soil are readily available.

Cost

The preliminary cost estimate for Remedial Alternative D is \$3.5 million, if all waste is assumed to be non-hazardous and suitable for disposal at a Class 2 landfill, or \$4.7 million if 85% of the total soil is considered California hazardous waste but not a RCRA hazardous waste (see Table 21). This percentage of 85% California hazardous waste for the high end of the cost estimate was selected based on a review of the total arsenic and total lead concentrations for soil within the potential remediation area (Table 15) and the WET analytical results (Table 2) relative to the STLCs for these metals (Section 2.2.2.2).

Regulatory Agency and Community Acceptance

It is likely that this alternative would be accepted by the regulatory agencies and the community members because action is taken to mitigate the potential risks and RAOs would be achieved.

4.4.4.2 State Criteria Evaluation for Remedial Alternative D

Remedial Alternative D is evaluated below according to the State criteria described in Section 4.3.2.

Health and Safety Risks Posed by Site Conditions

This alternative would provide the most protective reduction of health and safety risks by removing contaminants from the Site. Health and safety risks during remediation activities would be managed by implementation of a Site-specific Health and Safety Plan.

Effect of Contamination upon Beneficial Uses of Resources

This alternative would regain the beneficial use of the land resource for the Site. There is no loss of beneficial use of groundwater, as groundwater is not impacted by Site contaminants.

Effect on Groundwater Resources

This alternative is protective of groundwater resources because no groundwater impact has resulted from the presence of contaminants in Site soil during the past years or decades, and the proposed remedial actions would not result in increased risk to groundwater.

Site-Specific Characteristics

This alternative would eliminate potential off-Site migration of contaminants in fugitive dust because contaminants would be removed from the Site.

Cost Effectiveness

Costs are considered very high, as described above.

Potential Environmental Impacts of Remedial Action

This alternative would not result in additional long-term environmental impacts. Potential air quality issues during remedial actions would be addressed by preparation and implementation of a Site-specific Health and Safety Plan, as described above. Temporary increases in traffic and noise would be managed by implementation of a Transportation Plan.

4.4.5 Remedial Alternative E: Comprehensive Soil Excavation and On-Site Consolidation with Institutional Controls

Remedial Alternative E consists of excavation of soil from the areas of the Site where the arsenic, lead and TPH concentrations exceed the remedial goals (Section 3.5), with excavated soil placed into an on-Site consolidation cell instead of being disposed at a landfill off-Site. Clean fill would be imported to the Site to provide an acceptable grade for future Site use. Confirmation soil samples would be collected from the sidewalls and bottom of the excavated areas prior to or following excavation to confirm the removal of soil containing arsenic, lead, and TPH above remedial goals. Remedial Alternative E would also include groundwater monitoring and institutional controls as described under Remedial Alternative B, including a deed restriction to (a) limit activity to include only vehicle parking in the area of the Site where COPCs are above the remedial goals, and (b) require hazardous materials trained contractors if any subsurface work would be performed in the soil in the area of the Site where COPCs are above remedial goals. Additionally, Alternative E would include a progress review with the DTSC on a 5-year interval in order to re-evaluate the effectiveness and protectiveness of Alternative E. This review would be conducted consistent with the U.S. EPA Comprehensive Five-Year Review document dated June 2001 and produced by the Office of Emergency and

Remedial Response authorized by CERCLA, (U.S. EPA, 2001) and would be conducted every five years as long as contaminated soil remains on-Site.

Specific soil sample locations included in the area potentially requiring excavation are shaded in Table 10. The assumed extent of soil excavation under Remedial Alternative E would be the shaded area shown on Figure 25, which is approximately 178,000 square feet (i.e., the same as Alternative D). The full volume of soil summarized in Table 15 would be excavated, which would remove all locations identified in Table 10 where COPCs are above remedial goals. The estimated volume of soil potentially requiring excavation is approximately 18,300 bcy, which is estimated to be equivalent to approximately 31,100 tons (Table 15). These quantities are estimates only.

The data presented in Table 10 were used to estimate the 95% UCL of arsenic in the excavated soil to be placed in the on-Site consolidation cell. The estimated 95% UCL for arsenic in soil that would be placed in the on-Site consolidation cell under Remedial Alternative E is 120 mg/kg. Excavated soil would be placed in an on-Site consolidation cell for long-term management. An on-Site consolidation cell is an area at the Site where non-impacted native soil would be excavated to create the cell, a geotextile would be placed in the bottom of the excavation, contaminated soil from the Site would be compacted to fill the excavation, and an engineered cap would be constructed over the contaminated soil. The engineered cap would be described during the Remedial Design phase and would consist of layers of clean soil, geotextiles, and pavement.

The conceptual location for such a cell would be beneath the proposed parking area at the north side of the Site (Figure 24). The base of the cell could be located approximately 16 feet below the finish grade of the future parking lot, allowing for placement of up to 10 feet of contaminated soil within the cell covered by 6 feet of clean soil beneath the parking lot pavement. The 6 feet of clean fill would be intended to provide a “clean” zone for the placement and maintenance of pavement, underground utilities, and landscaping above the consolidation cell.

The consolidation cell would measure approximately 150 feet wide by 450 feet long, 16 feet in total depth, including a 6-foot thick soil layer and engineered cap, and cover an area of approximately 68,000 square feet. Such a cell would have a capacity of approximately 20,000 bcy of contaminated soil. The base of the consolidation cell would be at least 20 feet above the highest measured water table at the Site.

Remedial Alternative E includes groundwater monitoring to verify that groundwater quality is not impacted by the placement of contaminated soil in the on-Site consolidation cell. It is assumed that existing monitoring wells at the Site, including MW-1 and CF-3 (and possibly CF-1 and CF-2 if these locations conflict with future redevelopment) would be abandoned prior to excavating and consolidating soil at the Site. The long-term groundwater monitoring is assumed to include installation and monitoring of one new monitoring well on the upgradient (northern) edge of the Site and three new groundwater monitoring wells south (downgradient) of the consolidation cell. The monitoring wells

would be sampled annually and analyzed for metals and TPH. A report of monitoring results would be submitted to DTSC following each monitoring event. A detailed monitoring plan would be prepared for regulatory approval prior to installing wells and monitoring groundwater.

4.4.5.1 Federal Criteria Evaluation for Remedial Alternative E

Remedial Alternative E is evaluated below according to the Federal criteria described in Section 4.3.1.

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment because capping the contaminated soil prevents exposure to the hazardous substances in the soil. However, since the contaminated soils would be placed deeper, there would be a greater potential of contaminant migration to groundwater.

Compliance with ARARs, TBCs, and RAOs

This alternative would comply with ARARs, including Title 22, CCR, Section 67391.1, which specifies that a land use covenant imposing appropriate limitations on land use shall be executed and recorded when hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land. This alternative would comply with local agency requirements, such as a grading permit from the Alameda County, Building Inspection Department.

Long-Term Effectiveness

This alternative would be effective by capping the contaminated soils with a permanent cover and placing deed restrictions on the capped areas. However, contaminants would be placed closer to groundwater, potentially introducing a risk of migration to groundwater. Regular inspection, maintenance, and groundwater monitoring would reduce this risk.

Reduction of Mobility, Toxicity, or Volume

The mobility of the soil contaminants at the Site would be reduced by the cap precluding infiltration of precipitation. The toxicity and the volume of contaminants would remain the same since the contaminated soil would be left in-place.

Short-Term Effectiveness

This alternative would be effective and meet RAOs in the short-term. Potential short-term risks for this alternative include generation of air-borne contaminants in dust, and

physical hazards from construction equipment during grading. These short-term risks would be addressed by preparation and implementation of an Air Monitoring Plan and a Health and Safety Plan that would specify engineering and administrative controls, such as dust suppression, when needed. The air or dust monitoring protocol would be included where applicable in the Air Monitoring Plan and Health and Safety Plan.

Implementability

Labor, materials, and equipment for excavating and consolidating the contaminated soil and constructing the cap are readily available.

Cost

For cost estimating purposes, two scenarios are considered for Remedial Alternative E. One scenario, the construction of a single consolidation cell, is described above. The second scenario is to construct a more shallow consolidation cell in the area described above, with an additional consolidation cell in the proposed park area on the western portion of the Site.

The preliminary cost estimate for Remedial Alternative E is \$3.0 million assuming a single on-Site consolidation cell, or \$3.8 million, assuming two shallower on-Site consolidation cells (see Table 22). The present worth cost was calculated assuming discount rates (i.e., inflation rates) of 2.6% for a 5-year term or 3.0% for a 30-year term (OMB, 2006). Unit cost factors used to develop the cost estimates for Alternatives B, C, D, and E are provided in Table 23.

Regulatory Agency and Community Acceptance

This alternative would not likely be accepted by the regulatory agencies because of the greater potential for contaminant migration to groundwater. This alternative would likely not be acceptable to the community members because the contamination would be placed closer to the groundwater.

4.4.5.2 State Criteria Evaluation for Remedial Alternative E

Remedial Alternative E is evaluated below according to the State criteria described in Section 4.3.2.

Health and Safety Risks Posed by Site Conditions

This alternative would reduce health and safety risks by consolidating contaminants in a controlled area and establishing an institutional control such as a land use restriction and implementing maintenance of the existing Site cover to prevent exposure to

contaminants. Health and safety risks during remediation activities would be managed by implementation of a Site-specific Health and Safety Plan.

Effect of Contamination upon Beneficial Uses of Resources

This alternative would regain the beneficial use of the land resource for the Site. There is no loss of beneficial use of groundwater, as groundwater is not impacted by Site contaminants.

Effect on Groundwater Resources

This alternative is potentially less protective of groundwater resources because no contaminants would be placed in a deep consolidation cell closer to groundwater.

Site-Specific Characteristics

This alternative would reduce potential off-Site migration of contaminants in fugitive dust because contaminants would be moved into controlled and maintained areas.

Cost Effectiveness

Costs are considered high, as described above.

Potential Environmental Impacts of Remedial Action

This alternative would not result in additional long-term environmental impacts. Potential air quality issues during remedial actions would be addressed by preparation and implementation of a Site-specific Health and Safety Plan, as described above. Temporary increases in traffic and noise would be managed by implementation of a Transportation Plan.

4.4.6 Comparative Analysis of Remedial Alternatives Using Federal Criteria

A comparative analysis of the five remedial alternatives using the Federal criteria is provided below and in Table 24.

4.4.6.1 Threshold Criteria Analysis

Alternatives C, D, and E provide overall protection of human health and the environment and compliance with ARARs, TBCs, and RAOs. Alternative A does neither. Alternative B provides overall protection of human health and environment but does not comply with RAOs.

Overall Protection of Human Health and the Environment

Alternative A does not provide any measures to prevent exposure to COPCs in Site soil and therefore would not be protective of human health and the environment. Alternative B prevents exposure to COPCs through the use of a maintained Site cover, and therefore is considered protective of human health and the environment. Alternative C would be protective of human health and the environment by excavation of soil that exceeds the remedial goals during Phase I, focused excavation of soil during Phase II, and elimination of exposure pathways. Unexcavated areas would be covered with hardscape and/or limited softscape, and human exposure would be controlled through maintenance of these covers, land use restrictions, and implementation of an O&M and Soil Management Plan and a Health and Safety Plan. Alternative D is judged to be the most protective of human health and the environment since this alternative includes comprehensive excavation and off-Site disposal of soil where COPC concentrations exceed the remedial goals. Alternative E is considered potentially less protective of human health and the environment than Alternative D because soil containing COPCs would be placed in a deep consolidation cell closer to groundwater and would require proper implementation of cover inspection/maintenance, groundwater monitoring, and institutional controls to prevent exposure or leaching to groundwater.

Compliance with ARARs, TBCs, and RAOs

Alternative A would not comply with ARARs, TBCs, and RAOs because exposure to soil containing COPCs above remedial goals would not be mitigated and this alternative would not allow development of the property. Alternative B would comply with ARARs and TBCs by reducing potential human exposure and protecting groundwater, but does not achieve RAOs. Alternatives C, D, and E are in compliance with ARARs, TBCs, and RAOs by using a combination of soil removal and/or deed restrictions to attain acceptable risk levels. Alternatives C, D, and E fully attain the RAOs by removing the potential for exposure to arsenic-contaminated soil and facilitating Site redevelopment by not restricting access to the central portion of the Site (i.e., where contaminated soil would remain under Alternative B).

Alternatives C, D, and E fully satisfy the two Threshold Criteria. Although Alternatives A and B do not satisfy the Threshold Criteria, they were retained for further analysis for comparison purposes in accordance with NCP guidance.

4.4.6.2 Primary Balancing Criteria Analysis

Alternatives C, D, and E satisfactorily provide long-term effectiveness and permanence, reduce mobility and volume of COPCs at the Site, and are effective in the short-term, whereas Alternatives A and B are not. All alternatives are implementable. Alternative D has the highest estimated cost and costs for Alternatives C and E are high.

Long-Term Effectiveness and Permanence

Alternative A includes no protection against human exposure to COPCs; therefore, it is not considered effective. Alternative B would be potentially effective long-term, provided cover maintenance and monitoring and land use restrictions were implemented properly; however, this Alternative is ineffective at achieving RAOs.

Alternatives C, D, and E are considered to satisfy the long-term effectiveness and permanence criterion. Alternative C meets this criterion by removing soils from areas of greatest potential future exposure and covering soils to restrict exposure in all other areas. Alternative D meets this criterion by removing the contaminated soil from the Site. Alternative E meets this criterion by placing the contaminated soil beneath an engineered cap in an area designated for use as a parking lot. The effectiveness of Alternatives C and E is dependent on the maintenance of the cover over contaminated soil. As such, there is no practical likelihood of any significant future direct contact with the contaminated soil.

Reduction of Mobility, Toxicity, or Volume

Alternatives A and B would provide no reduction of toxicity, mobility, or volume of contaminated soil. Alternatives C and D would provide a reduction of mobility, toxicity, and volume of contaminated soil excavated and disposed in an off-Site landfill with potential treatment. Covering contaminated soil remaining in place during phase II of Alternative C provides a reduction in mobility. Alternative E would provide a reduction in mobility of COPCs in Site soil by maintenance of a cover and implementation of a land use restriction, but would not reduce the toxicity or volume of contaminated soil on the Site.

Options for reducing mobility (solidification/stabilization) were screened in Section 4.1. However, since available data do not indicate a concern for arsenic mobility (i.e., leaching to groundwater), such options were not retained in the remedial alternatives. No remediation technologies were identified that would feasibly reduce the toxicity and volume of contaminated Site soil following on-Site treatment.

Short-Term Effectiveness

Alternative A would not be effective, and Alternative B would not effectively achieve RAOs in either the short- or long-term.

Phase I and off-Site disposal during Phase II of Alternative C and Alternatives D and E are considered to be effective in the short term with implementation of control measures, such as dust suppression, during construction. The implementation of each alternative is expected to take approximately one year of construction, which is a relatively short period of time. Conversely, the excavation of up to approximately 18,300 cubic yards of soil has the potential to create fugitive dusts during the soil excavation and handling. If

not managed properly, such fugitive dusts could be a concern for air quality at and near the Site during the remedial action. However, projects such as this have been successfully completed in the San Francisco Bay Area, and engineering controls and air monitoring are included in Alternatives C, D, and E to reduce fugitive dust emissions and protect air quality during the work. Before field activities begin, the construction contractor should prepare a site-specific Health and Safety Plan that specifies, among other things, employee training and personal protective equipment, training and medical surveillance requirements, standard operating procedures, and a contingency plan that conforms to the requirements of Title 8, CCR, Section 5192 and 29 CFR 1910.120 et seq. and other applicable Federal and State laws and regulations.

Implementability

As presented in Table 24, all alternatives would likely be implementable. Alternatives A and B are readily implementable since they require no soil excavation and either no or minimal Site activities. Alternatives C and D, which include shallow soil excavation and off-Site soil disposal, are also readily implementable using available contractors and standard earth-moving equipment.

Alternative E, which may include construction of an on-Site consolidation cell, is also considered implementable. Available information indicates space is available for the cell, laterally and vertically, and there are no sub-surface utility obstructions (a fiber-optics line does cross the Site, but at a location south of the proposed location for the consolidation cell). Observations during investigations indicate native soil is relatively stable, which would facilitate construction, possibly with up to 5 feet of un-shored vertical sidewalls. It is anticipated the cell would be constructed by contractors present in the area and using standard earth moving equipment.

Cost

Costs have been estimated for all of the remedial alternatives except for Alternative A (No Action), which was found to have no associated cost. As shown in Table 26, the soil excavation alternatives resulted in the highest estimated costs. Of the excavation alternatives, estimated costs for Alternatives C and E are similar, and Alternative D has the highest estimated costs (particularly when a substantial portion of the excavated soil is presumed to be a California hazardous waste but not a RCRA hazardous waste).

4.4.6.3 Modifying Criteria Analysis

Alternatives C and D are presumed acceptable to the state and community, and Alternatives A, B, and E are not.

State Acceptance

Alternative A is presumed unacceptable to the State as it provides no protection against the potential risks of COPCs in Site soil. Alternative B is presumed to be unacceptable to the State because it does not provide a permanent measure to reduce risks and does not improve the beneficial uses of the Site.

Alternatives C and D include comprehensive soil excavation or maintenance of covers over soil with COPCs above remedial goals, which results in expected compliance with ARARs, TBCs, and the RAOs. Therefore, these alternatives are presumed to be acceptable to the State. Alternative E places contaminated soil closer to groundwater and is presumed to be unacceptable to Alameda County Water District. Documents pertaining to the remedial action on the Site will be reviewed by the DTSC and the Alameda County Water District and their comments incorporated prior to implementation.

Community Acceptance

Because Alternative A is presumed to be unacceptable to State regulators, it is also presumed to be unacceptable to the local community. Similarly, Alternative B may potentially be unacceptable to the community if adequate engineering and institutional controls are not implemented, or if this alternative restricts future development.

Alternatives C and D are presumed to be acceptable to the local community assuming dust control and other potential community issues, such as truck traffic control, are adequately addressed during implementation of the soil excavation and handling activity. Alternative E is presumed to be unacceptable to the community because it is presumed to be unacceptable to Alameda County Water District.

4.4.7 Comparative Analysis of Remedial Alternatives using State Criteria

A comparative analysis of the five remedial alternatives using the State criteria is provided below and in Table 25.

Health and Safety Risks Posed by Site Conditions

Findings from the human health risk evaluation (Section 3.1) indicate a potential future risk if the Site is left for unrestricted land use without remedial action. Alternative A would not reduce these risks. Alternative B would reduce the risk by maintaining a cover over contaminated soil and implementation of institutional controls. Alternatives C, D, and E are considered the most protective in that surface soil containing arsenic above the remedial goals will be covered or excavated and either disposed off-Site (Alternative C or Alternative D) or consolidated into a smaller area covered by asphalt and/or concrete (Alternative E).

Effect of Contamination upon Beneficial Uses of Resources

This criterion evaluates the effect of contamination or pollutant levels upon present, future, and probable beneficial uses of threatened resources. Available data indicate the beneficial use of groundwater beneath the Site has not been impaired. Further, none of the remedial alternatives is expected to result in any loss of beneficial uses of groundwater.

The occurrence of COPCs in soil has impaired the beneficial use of the land surface at the Site. Removing surface soil with COPCs above remedial goals under Remedial Alternatives C, D, and E will allow future use of that land and facilitate Site redevelopment.

Effect on Groundwater Resources

As indicated above, all of the remedial alternatives are considered protective of groundwater resources, which have not been impaired by the current conditions.

Site-Specific Characteristics

This criterion considers site-specific characteristics, including the potential for off-Site migration of chemicals of concern. Under current conditions, off-Site migration of COPCs could occur in fugitive wind-blown dusts; therefore Alternative A is not acceptable. Alternative B would reduce the potential for this occurrence, Alternatives C, D, and E would substantially reduce the potential for off-Site migration by covering or removing surface soil where arsenic, lead, and TPH are known to exceed the remedial goals.

Cost Effectiveness

According to the CHSC, this factor evaluates the cost-effectiveness of alternative remedial action measures, including total long-term and short-term costs. Table 26 summarizes the estimated costs for each alternative. Cost effectiveness is discussed in Section 4.4.6.2 under the federal criteria evaluation.

Potential Environmental Impacts of Remedial Action

No environmental impacts are associated with implementing Alternatives A and B, as no construction or Site modifications are involved.

Alternatives C, D, and E all involve soil excavation and handling. Such activity has the potential for impacting air quality due to fugitive dust generation. However, engineering controls and monitoring would be performed to reduce and monitor impacts on air quality.

Alternative E includes placing contaminated soil in an on-Site consolidation cell, which results in contaminated soil being relocated to a deeper location at the Site and therefore closer to the groundwater. However, as discussed in Section 4.4.5, low hydraulic conductivity of the native soil at the Site, covering the consolidation cell with pavement and clean soil, and the lack of impacts to groundwater under existing conditions, collectively indicate a low likelihood that arsenic from the consolidated soil would impact groundwater. Groundwater monitoring would be performed to confirm groundwater is not impacted.

Detailed environmental impact evaluations for each alternative are included in the California Environmental Quality Act (“CEQA”) Negative Declaration and Initial Study prepared for this Site, which is included in Appendix F.

4.5 Recommended Alternative

Alternatives A and B were not selected due to their lack of adequate protectiveness to human health and the environment, noncompliance with ARARs or RAOs, ineffectiveness, insufficient reduction to the mobility, toxicity, or volume of contaminants, and continued loss of beneficial use of land resource. Additionally, Alternative A was not selected due to lack of regulatory and public acceptance, unacceptable health and safety risks, and ongoing potential for off-Site migration of chemicals in fugitive dust.

Alternatives C, D, and E were judged similarly on most of the Federal and State evaluation criteria. For example, Alternatives C, D, and E are each considered protective of human health and the environment, compliant with ARARs and RAOs, potentially effective, implementable, likely to reduce health and safety risks, protective of soil resources, and compatible with site specific characteristics. Some minor differences are that Alternatives C and D may have greater short-term impacts to the community due to off-Site soil transportation, whereas Alternative E may have greater short-term impacts due to a longer construction period given the need to construct an on-Site consolidation cell. In addition, ACWD does not consider Alternative E to be protective of groundwater quality and would likely not approve implementation.

The primary difference between Alternatives C and D is cost (Table 26). Alternative D (\$4.7 million) is more costly than Alternatives C (\$4.3 million) or Alternative E (\$3.0 to \$3.8 million), without a concurrent benefit to human health or the environment. As such, Alternative C (excavation and removal in Phase I area and removal and covering in Phase II area) is the apparent best remedial alternative for the Site. However, if it is determined during the remedial design that complete removal in the Phase II area has similar costs as covering, then a remediation similar to Alternative D will be implemented. A Statement of Reasons supporting the selection of this alternative is included in Appendix E.

5 REMEDIAL ACTION IMPLEMENTATION

The implementation plan and schedule and the public involvement components of the remedial action plan are described in this Section.

5.1 Implementation of the Selected Remedial Alternative

The key components of the proposed remedial action are as follows:

During Phase I, soil containing arsenic, lead, and TPH at concentrations above the remedial goals will be excavated from the town square area and disposed off-Site in a permitted facility;

The Phase I areas identified as requiring remediation to meet the RAOs will be excavated, sampled to confirm removal of soil containing COPCs above remedial goals, backfilled with clean soil, and will become available for unrestricted development and use for building construction, installation of utilities, or deep root landscaping;

During Phase II, soil containing arsenic, lead, or TPH at concentrations above the remedial goals will be excavated from below proposed building footprints, utility corridors, and planting areas and disposed off-Site to permitted. As described below, the City may elect to remove all soils containing COPCs at concentrations above remedial goals from the Site. The final areas of covering or removal will be determined in the remedial design;

The Phase II areas identified as requiring remediation to meet the RAOs will be excavated, sampled to confirm removal of soil containing COPCs above remedial goals, backfilled with clean soil, and will become available for unrestricted development and use for building construction, installation of utilities, or deep root landscaping;

The unexcavated portion of the Phase II area (i.e., parking and other non-structural use areas) where soil contains COPCs above remedial goals will be covered with redevelopment materials such as hardscape and/or limited areas of softscape to limit potential exposure to future populations. Detailed plans for any such covering in the Phase II area will be submitted to the DTSC for review and approval;

Inspection and monitoring of the hardscape and limited areas of softscape covering Site soil containing COPCs above remedial goals will be performed periodically following the remediation activities to document that the covers are effectively preventing human exposure to soil containing COPCs at concentrations above remedial goals. A review of

the remedy would be conducted every five years as long as contaminated soil remains on-Site consistent with the U.S. EPA Comprehensive Five-Year Review document dated June 2001 and produced by the Office of Emergency and Remedial Response authorized by CERCLA (U.S. EPA, 2001);

Dust control and ambient air monitoring will be performed during the excavation and handling of contaminated soil at the Site to protect ambient air quality at and adjacent to the Site during implementation of the remedial action;

Deed restrictions will be placed on any unexcavated portion of the Phase II area where soil contains COPCs above remedial goals in the form of a land use covenant which, at a minimum, will include the following requirements:

- a) The locations where Site soil contains COPCs above remedial goals will be limited to commercial or industrial land use or parking;
- b) Activities that will disturb the contaminated soil will not be permitted without a Soil Management Plan and Health and Safety Plan approved by DTSC; and
- c) Contaminated soil brought to the surface by grading, excavation, trenching, or backfilling will be managed in accordance with applicable provisions of state and federal law.

As described above, Fremont may choose to excavate and dispose of all Site soil in the Phase II Area containing COPCs above remedial goals. In this instance, no long-term monitoring, maintenance, inspection, review, or deed restrictions would be required after the completion of Phase II remediation activities. Phase II of Alternative C as described herein is conceptual. A detailed Remedial Design plan for Phase II will be submitted to DTSC for review at a later time as part of a specific proposed redevelopment, as described below. The Phase II Remedial Design will include a detailed cost comparison between covering and off-Site disposal.

The area of soil potentially requiring remediation within the proposed development Phase I and Phase II areas is shown on Figure 27. Implementation of the selected remedial action would include the following tasks:

Task 1: Preparation of a Remedial Design plan that describes the details of work to be implemented and sequence of remedial actions. The Phase II portion of Alternative C described herein is conceptual. The details for implementing this alternative will be described in the Phase II Remedial Design plan. The Remedial Design will include the following:

- a) A Sampling and Analysis Plan will describe procedures for sampling to confirm removal of contaminants above the remedial goals in the Phase I

excavation area. A separate Remedial Design Plan will be completed for the Phase II excavation area at a later date.

- b) An Air Monitoring Plan for collection of data that will be used to guide health and safety procedures during the remedial action (worker air monitoring) and to document conditions during the construction activities (perimeter monitoring). The air monitoring program will utilize direct-reading instruments to provide real-time data.
- c) A Transportation Plan for the handling, transportation, and disposal of contaminated soil exceeding the remedial goals according to applicable regulations and in an environmentally sound and safe manner.
- d) A Health and Safety Plan that specifies, among other things, employee training and personal protective equipment, training and medical surveillance requirements, standard operating procedures, and a contingency plan that conforms to the requirements of 29 CFR 1910.120 et seq. and other applicable Federal and State laws and regulations, including Title 8, CCR Section 5192.
- e) A Quality Assurance/Quality Control Plan that includes information on project organization and responsibilities with respect to sampling and analysis; quality assurance objectives for measurement including accuracy, precision, and method detection limits; sample custody procedures and documentation; field and laboratory calibration procedures; analytical procedures; laboratory to be used certified pursuant to CHSC section 25198; specific routine procedures used to assess data (precision, accuracy and completeness) and response actions; reporting procedure for measurement of system performance and data quality; data management, data reduction, validation and reporting; and internal quality control.

Task 2: Completion of Contract Documents for procurement of a prime construction contractor to perform the remedial action.

Task 3: DTSC preparation and issuance of a work notice to the community and facilitation of a public briefing, if appropriate, prior to initiating the remedial action.

Task 4: Selection of a qualified prime construction contractor and complete contract negotiation and award. The selected contractor will need to possess a Hazardous Substance Removal Certification from the Contractors State License Board.

Task 5: Contractor procurement of necessary permits and utility clearances prior to the commencement of excavation activities at the Site.

Task 6: Initiation of the remedial action after completion of the above tasks. Before mobilization to the Site, the construction contractor will prepare a site-specific Health and Safety Plan for the remedial action, including excavation and off-Site disposal of

contaminated soil, backfilling the excavation with clean soil approved by DTSC, and necessary compaction and grading for the town square development.

Task 7: Preparation of a Remedial Action Completion Report summarizing the remedial actions and including as-built drawings for submittal to DTSC.

Task 8: When the City of Fremont is prepared to implement Phase II, Tasks 1 through 7 will be repeated as necessary. In addition to the plans identified in Task 1, Phase II Remedial Design will include a cover design, if soil containing COPCs above remedial goals will remain on-Site.

Task 9: Preparation of an O&M and Soil Management Plan to provide procedures for inspection and maintenance of the cover for Site soil containing COPCs above remedial goals (only needed if such soil remains on-Site). The O&M and Soil Management Plan will be implemented as long as soil containing COPCs at concentrations above remedial goals remains on-Site. The City of Fremont and DTSC will enter into an O&M Agreement to ensure implementation of the O&M and Soil Management Plan.

Task 10: Preparation and execution of a Land Use Covenant by the City of Fremont and DTSC for recordation with the Alameda County Recorder's Office (only needed if soil containing COPCs above remedial goals will remain on-Site).

Task 11: DTSC certification of Site cleanup completion. DTSC approval of Site cleanup for Phase I will be issued with its approval of the Remedial Action Completion Report to facilitate the town square development.

Task 12: The groundwater monitoring well(s) within the town square area will be destroyed before the start of Phase I fieldwork. Groundwater monitoring wells in the Phase II area will be sampled before the start of Phase II fieldwork. The wells will be destroyed if the COPCs are not detected. If the COPCs are detected above MCLs for metals and ESLs for TPH, DTSC and the ACWD will be consulted prior to destroying the wells.

5.2 Implementation Schedule for Selected Remedial Alternative

The tentative schedule for remedial work is as follows:

Draft RAP Comment Period:	1 Month
Final RAP/Responsiveness Summary:	2 Weeks
Phase I Remedial Design Plan Review by DTSC:	1 Month
Phase I RAP Implementation/Town Square Construction:	12 Months

Phase I Remedial Action Completion Report:

2 to 3 Months

Phase I remedial action and redevelopment of the town square area are planned to begin in 2006 and require approximately one year to complete. Phase II of the remedial action includes focused remediation of areas outside the town square area and construction of commercial/residential properties and parking facilities. Phase II is anticipated to begin in late 2008 or early 2009 and will take between 6 to 18 months to complete, depending on the specific nature of the clean-up method that is used and the development plan.

5.3 California Environmental Quality Act

In accordance with CEQA, DTSC has evaluated the proposed remedial action to determine associated potential adverse environmental impacts and has determined that the proposed remedial action would have no significant impact on the environment. Therefore, DTSC has prepared a Negative Declaration and Initial Study in compliance with CEQA for the project (Appendix F).

5.4 Public Involvement

The following activities, among others, will be conducted to obtain public input regarding the investigation and remediation of the Site:

Distribution of fact sheets and flyers to members of the public identified on the mailing list to be developed for the project;

Solicitation of comments from interested citizens, local government officials, and potentially responsible parties (“PRPs”) concerning the Draft RAP;

A public meeting to obtain input from interested citizens, local governmental officials, and PRPs concerning the Draft RAP; and

Creation of an information repository where the Draft RAP, Negative Declaration and Initial Study, and other Site-related technical documents are available for review by the public.

The City of Fremont will propose details of this public participation program in a separate submittal. Information regarding previous public meeting information is included in Appendix G.

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